MAY 1961

First Report of Metalcasting Trends Panel 45

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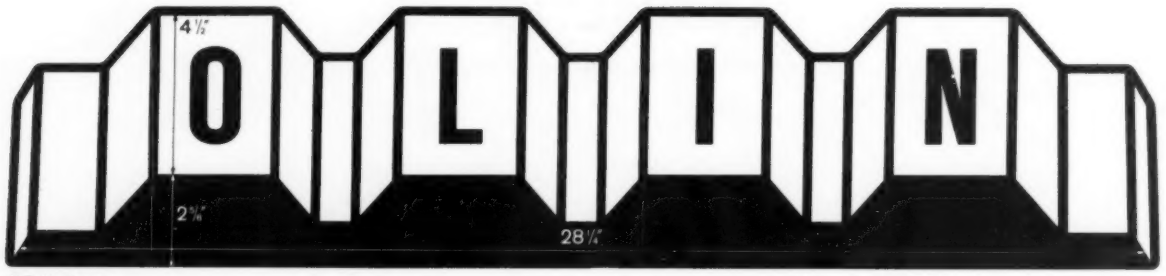
105 New Technology Breakthroughs of 1961 69

modern castings

the technology-for-profit magazine

50-lb. ingot



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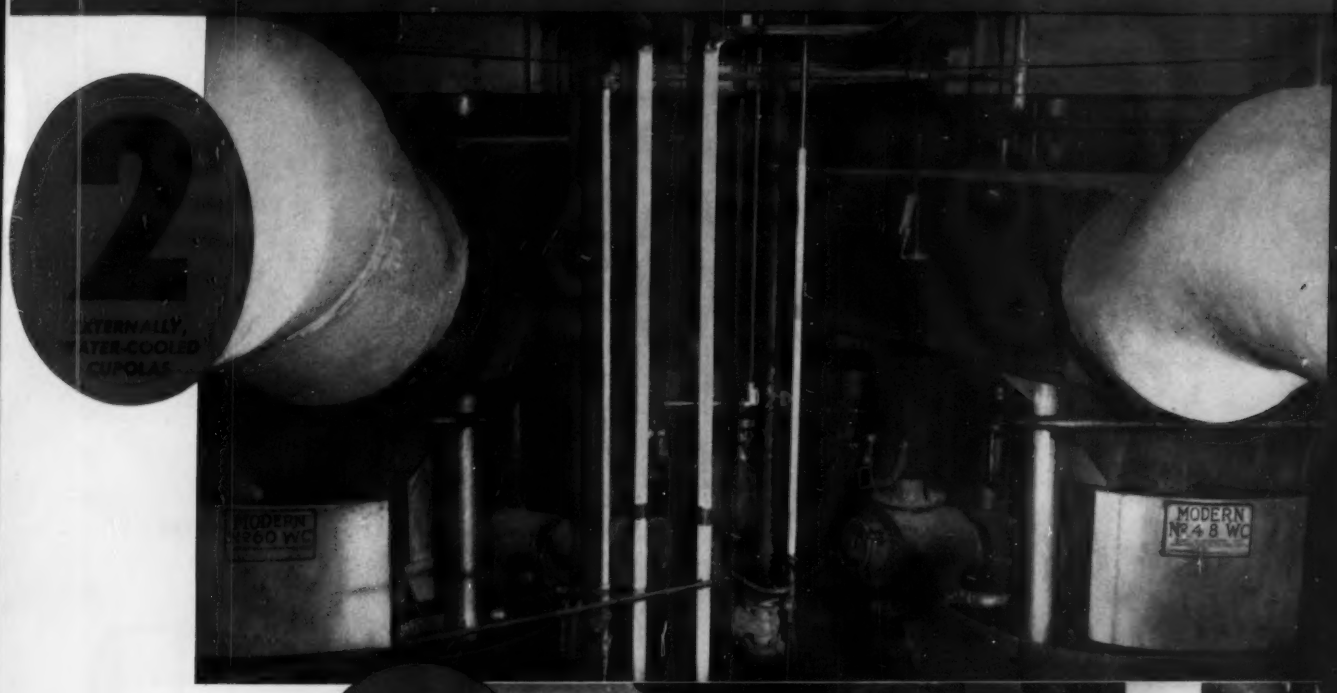
Circle No. 121, Pages 137-138

MORE ABOUT WATER-COOLED CUPOLA OPERATION



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MODERN

MODERN EQUIPMENT COMPANY

Dept. MC-5

Port Washington, Wisconsin

May 1961 Vol. 39, No. 5

modern castings

metalcasting "technology-for-profit"

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Drawn by CHARLES ROTH. San Francisco, site of 65th AFS Castings Congress.

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JUNE ISSUE

On-the-Spot Report of 65th AFS Castings Congress
Market Opportunities for Magnesium Castings
MODERN CASTINGS Seminar on Metalcasting Sales Problems

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Circle No. 123, Pages 137-138

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Let's look at . . .

Leadership Service for You

H. E. Green

MODERN CASTINGS IS DESIGNED to provide three important services for you: *to alert you* to what is new and important in metalcasting today; *to inform you* about the NEW profit-making technology of the field; and *to interpret for you* the significance of this new technology—its business applications, its profit potentials.

Furthermore, these three services are provided either on an *exclusive* basis (such as the new technology-for-profit breakthroughs), or on a semi-exclusive basis. The latter are stories which can be done best by MODERN CASTINGS because of its expert, tailor-made editorial staff and key information sources.

This all-important MAY Convention Issue is a good example in many ways. For instance:

. . . There's an exclusive report of the Metalcasting Trends Panel. Composed of selected bellwether executives and companies of the industry, you get the first-hand thinking of industry *do-something* leaders on what's ahead for the last half of 1961. This analysis starts on page 45.

. . . An interpretative study, especially prepared by MODERN CASTINGS, shows where the best markets for castings are today. This begins on page 52. It's exclusive!

. . . The *NEW TECHNOLOGY OF THE YEAR!* You'll find exclusive, copyrighted summaries of 105 breakthroughs (presented *in advance* of the AFS Castings Congress in San Francisco) on page 69.

. . . Beginning on page 91 is the Exhibition-in-Print, a special section presenting the products and services of MODERN CASTINGS advertisers for 1961, thus far. On page 139 is a Products Directory. And you'll find the usual Service Card on pages 137 and 138. All this is a special information feature designed for your use.

. . . If you're looking for local-level news (sent in by MODERN CASTINGS' 48 correspondents), it begins on page 122.

As we mentioned last month, MODERN CASTINGS is the one *official* reporting medium for the 65th AFS Castings Congress. This top event of 1961 for metalcasters will be held May 8-12, inclusive, in San Francisco. You'll get interpretative reporting and on-the-spot coverage of this key event in the June Post-Convention issue.

If there's something *new* in metalcasting technology, chances are that you'll find it *first* and exclusive in MODERN CASTINGS!

Harold E Green

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Looking at Business with Modern Castings

FIRST MC PANEL REPORT

Business recovery signs are becoming more positive. The work day is lengthening for wage earners, according to the Department of Labor. The stock market is continuing strong. Durables show promise in the months ahead. But do not expect a sharp upturn in the national economy. Gear for a moderate increase.

This view is corroborated by the first report from the blue-chip MODERN CASTINGS TRENDS PANEL. (See page 45, this issue.) Composed of leading key executives in metalcasting, producers and suppliers, the panelists show that the industry's pacesetters will move forward on a broad front. Some 10 areas are listed, including quality control, mechanization, and sales efforts.

Significantly, more than 56 percent of panel companies will purchase obsolete equipment during the last six months of 1961. More than 31 percent will expand productive capacity.

You'll also find that expansion of research facilities will take place. This, in turn, means more emphasis on new products and market exploration. There's an important spurt going on.

Important: decision makers on products and purchases are becoming harder to identify. Product development is one reason.

CAPTIVE VS. JOB FOUNDRIES

A real issue is developing here. Bellwether panel members reveal positive opinions on both sides. Some 61 percent expect captive foundries to get a bigger share of the metalcasting business in 1961 as compared to 1960. But 33 percent say NO!

An aye: . . . "New requirements for 1961-65 for increased quality, lighter weight, lower costs, and new metals require larger capital commitments which the jobbing foundries generally are not prepared to undertake."

A nay: . . . "There will be fewer jobbing foundries in operation for 1961. But I foresee more tonnage in these established foundries. Tonnage in the captive foundries no doubt has increased, but I believe that a considerable number will farm out their casting production to the jobbing foundry."

BEST MARKETS FOR 1961

Big tonnage industries will still get the nod during the last half of the year: automotive, farm implement, heavy duty machinery and construction. But the emphasis will continue to be on making castings stronger and thinner, and dimensionally more accurate.

Do not overlook the glamor industries: space, missiles, and electronics—and defense. Also glances are arching toward appliances and other consumer goods industries.

Now you can melt this

ALUMINUM SCRAP
(Dealers' buying price f.o.b. New York in cents per pound)
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Aluminum crankcase ..... 8½— 9
1100 (3s) aluminum clippings 11½—12
Borings and turnings ..... 8½— 9
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AXS-679 (1 pct zinc) 23.00-24.00
(Effective Mar. 13, 1961)

...instead of this

The Brown Boveri coreless line-frequency induction furnace obsoletes fuel-fired furnaces for melting aluminum... offers lower overall melting and operating costs, superior metal, cleaner working conditions.

Here in perfected form from the world's most experienced builder of induction heating equipment is a furnace that makes it *practical and profitable* for you to melt light, bulky aluminum scrap which cannot be used in a fuel-fired furnace because of prohibitive metal losses. *Average losses certified by customer for long-term operation of 8 furnaces melting ingot, chips and machining scrap for aluminum auto parts: 3% based on weight of finished castings compared to weight of metal charged to furnaces!* Losses are even lower when melting ingot and heavy scrap – less than 1% as compared to 7% and higher in fuel-fired furnaces.

Other bonus features that are making this furnace the talk of the aluminum casting industry:

- Higher grade, more uniform metal through precise temperature control and natural stirring action. Highest output per unit – up to 19,000 lbs. per hour.
- Fast alloy changes. Furnace can be emptied and restarted with a cold charge. Uses substantially less flux.
- Clean, cool operating conditions. Virtually no fumes.
- You ram the crucible more easily; less curing time.
- Simple, foolproof design—easy to operate and maintain. One man operates several units. Uniquely suited to full automation.
- No clogging or cleaning of channels with this *coreless* design. No danger from metal freeze-ups and no need to hold heat between shifts and over weekends.

Get the whole story. Learn how this furnace can pay for itself while giving you better metal and better castings. Write today to Brown Boveri Corp., Dept. F5, 19 Rector St., New York 6, N. Y.

Above: a 360-KW Brown Boveri furnace for aluminum with melting rate of 1350 lbs./hr. Hydraulic tilting mechanism provides safety and precise control. Brown Boveri makes a full line of line, medium and high frequency induction heating equipment to assure the perfect mating of equipment to every metal and every application.

BROWN BOVERI

Circle No. 125, Pages 137-138

Around the World with Modern Castings

ENGLAND

Tin has long been an element with a questionable metallurgical reputation when present in iron. Combined efforts of the British Cast Iron Research Association and the Tin Research Institute have now established important benefits arising from tin's presence in pearlitic nodular iron. Small amounts of tin (0.042-0.150%) suppress formation of ferrite without producing massive cementite and increase perfection of graphite nodules. Tin additions progressively increase hardness and proof stress of irons of all silicon levels. If nodular iron is normalized, as much as 0.1 per cent tin can be tolerated without any harmful embrittling side effects. So traces of tin can have beneficial effects on nodular iron.

Leyland Motors, Ltd. has eliminated the hazard of partially burned-on sand remaining in internal passages of cylinder heads by installing a molten caustic soda cleaning bath. Castings are first heated to 265-300 F and then lowered into the 930 F caustic bath. After 25 minutes immersion they are drained, washed in cold water, then in hot water and followed by self drying. Sand sludge accumulates at rate of 0.45 cubic feet per ton of castings processed. Cleaning consumes an average of 44 pounds of caustic per ton of castings processed. Experience with several thousand castings has proven the cleaning process economical and completely reliable for removing all core sand trapped in internal passages.

ROUMANIA

A siliconized skin can be put on nodular iron castings to increase surface hardness and resistance to oxidation and acid corrosion. Castings are imbedded in a mixture containing 40 per cent Fe Si (75% Si), 59 per cent chamotte and 1 per cent NH_4 Cl. Castings are heated for about 4 hours and then cooled for about 12 hours down to 390 F. The hardened silicon skin also displays good adherence, compactness and strength.

WASHINGTON

Unfavorable tax depreciation allowances to industries in the United States have been a contributing factor in their inability to meet overseas competition. U. S. practices were recently compared with Great Britain, Canada, West Germany, Sweden, France, Italy and Japan by the Machinery and Allied Products Institute. They pointed out that in two of these countries the first year write-off for equipment purchases exceeds 50 per cent of cost. In two more it exceeds 30 per cent. The corresponding figure for the United States is 13 per cent. Two countries permit a recovery of more than 70 per cent of cost in the first three years of service and two more allow over 60 per cent. Our equivalent in this country is 35 per cent.

In an era when foundry mechanization and modernization are a must for survival a liberalized depreciation plan would be a big help in meeting competition, augment supply of capital funds, increase incentive to invest more capital into new equipment, and improve our metalcasting productivity.

KEY TO ADM PRODUCTS & SERVICES:

Check the products or services on which you would like to have more information. Then clip out this KEY, attach it to your letterhead, and mail to

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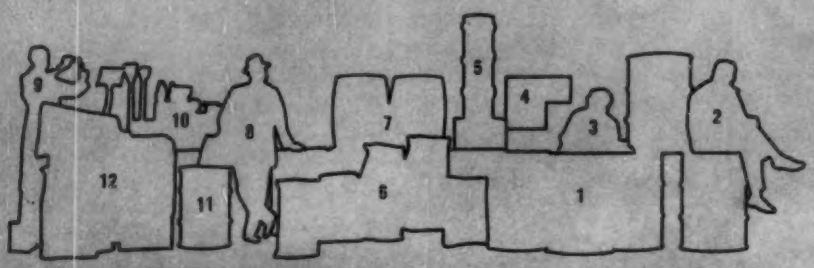
FEDERAL FOUNDRY SUPPLY DIVISION
2191 West 110th Street, Cleveland 2, Ohio



1. BINDERS FOR EVERY CORE PROCESS: Featuring CHEM-REZ A-200, the chemically-reactive binder that "bakes" at room temperature; CHEM-REZ "100", with hot box curing, makes intricate cores at high production rates; LIN-O-SET, ADM's air-setting binder; ADCOSIL, for CO_2 gas-cured cores; ADMIREZ foundry resin for shell molds and cores; LINOIL and INDUCTOL, industry's most reliable oils for quality baked-sand cores.

2. TECHNICAL FIELD SERVICE is an ADM extra that puts a qualified foundry engineer into your plant when you need him most.

3. FAST ORDER SERVICE: Prompt attention to handling and shipping your orders from a nationwide network of plants and warehouses is the constant aim of ADM.

4. TECHNICAL INFORMATION on all ADM products is available upon request.

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6. PRODUCTS FOR CONTROLLED CASTING QUALITY: GREEN BOND BENTONITE for maximum mold bonding strength with minimum moisture; CROWN HILL SEA COAL for consistent control of casting surface finish and dimensional stability; LIN-O-CEL and FEDERAL SAND STABILIZERS prevent thermal flaws in casting surfaces.

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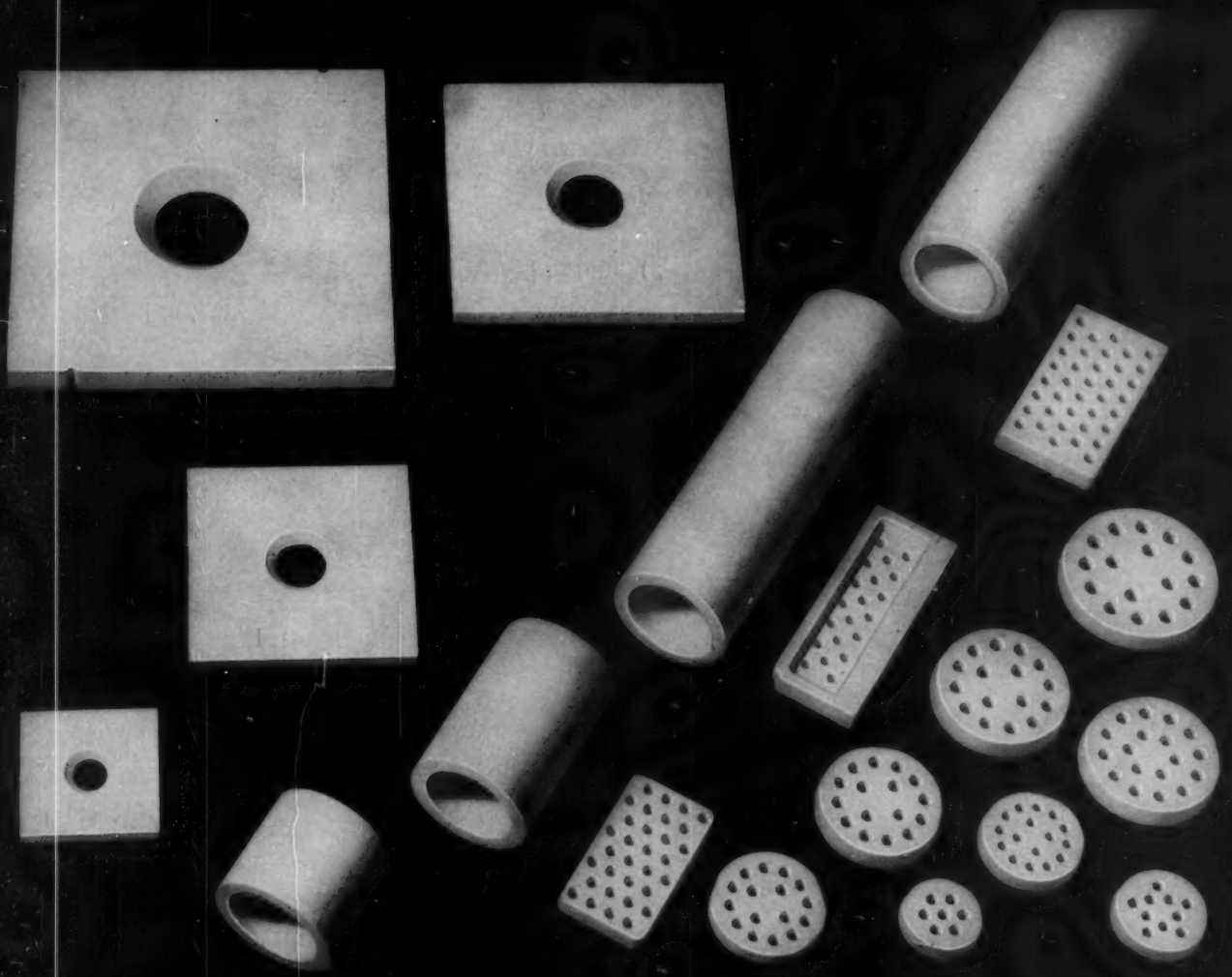
8. SALES SERVICE within easy reach. There's an ADM-MAN in your area ready to aid your foundry in the production of better cores and molds at less cost.

9. RESEARCH & DEVELOPMENT: ADM laboratories are dedicated to the development of new products and faster techniques to improve casting quality, speed production, and reduce costs. Services of the ADM laboratories are available to customers in the analysis of their special production problems.

10. SPECIAL FOUNDRY PRODUCTS, SUPPLIES & EQUIPMENT: SHOVELS, FLASKS, RUBBER PIEN SHOVEL HANDLES, PASTE BULBS, PITT-COR fiberglass core reinforcement, SPRAY CANS and over 200 other supplies are stocked in 50 warehouses ready for immediate shipment. If you need it, ADM carries it.

11. CORE PASTES: Several varieties available to answer your specific pasting needs on small or large cores of any composition, hot or cold.

12. WASHES & BLACKINGS: ADM offers a wide variety of refractory washes for spraying, swabbing, brushing or dipping. Among the types: Plumbago, Zircon, Ceramic, Graphitic, to assure smooth, clean, pattern-true casting finishes.



what users like best about

Louthan gating and risering refractories . . .

There's a good reason why Louthan is making more and more refractories for the foundry field. *Users like them,* like the way they perform on the job, like the cost reductions they make possible.

Louthan Strainer Cores are now available in more sizes and shapes—and for *steel, iron, brass* and *bronze* castings. All provide an accurate choke for positive control of metal flow, eliminate slag and oxide inclusions.

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Circle No. 127, Pages 137-138

MAGNESIUM

HINES "POP-OFF"® FLASKS

UP TO 25% LIGHTER!

STRONGER, *too!*

SIZES AVAILABLE IN MAGNESIUM:
10" x 12" through 24" x 24"

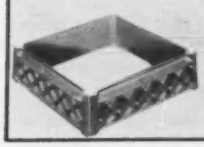
HINES POP-OFF FLASK

The many inherent advantages offered by HINES "POP-OFF" flasks are augmented by their fabrication in magnesium! The lighter weight will be appreciated by your molders. The extra strength will give you even more accurate production and lower maintenance costs. And, as always, HINES QUALITY will insure a higher percentage of perfect molds.

Here, then, is the ultimate in flask efficiency! If you're planning to improve mold production, be sure to investigate HINES *magnesium* "POP-OFF" flasks. A letter, wire or phone call will bring additional information and prices.

HINES CAST JACKETS

Used with HINES "POP-OFF" flasks, they'll provide economical, quantity production.



Less investment!

No stacks of tight flasks taking up valuable space!

Lower shake-out costs!

HINES

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IF IT'S A "POP-OFF"... IT'S HINES... IF IT'S HINES... IT'S THE BEST

Circle No. 128, Pages 137-138

Th-Mg: ONE REASON WHY VITRO'S RARE EARTH CHEMICAL / METAL ALLOY SALES ROSE 34% IN 1960.

There must be good reasons for this growth. And there are—consistent high quality backed by research. Perhaps Vitro's product development department can assist you. Do you have production difficulties adding alloy components or face burn-up problems where the use of master alloys can be effective? Vitro quality control provides guaranteed uniformity and offers end-product consistency. ■ In addition to thorium-magnesium master alloy, Vitro has developed several rare earth and related family alloy combinations. Its technical staff is anxious to join with you in formulating new alloy combinations and special custom blends. They also can supply pure metals of the rare earth family. Write today for complete technical literature and please feel free to discuss any specific research or production problem without any obligation. Address Product Development Department G.

Vitro's thorium-magnesium master alloy is extensively used in our nation's expanding missile effort. Some 40% of the "skin" on the USAF Titan missile is thorium-magnesium alloy.

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a Division of Vitro Corporation of America
342 MADISON AVENUE • NEW YORK 17, NEW YORK
Circle No. 129, Pages 137-138

From and For the Reader . . .

MARKETING CONFERENCE

It was very interesting to read the comments in the March issue of MODERN CASTINGS regarding the foundry marketing conference held in Milwaukee. It covers the subject perfectly.

We realize that some of the foundry organizations are doing similar work but we had hoped that through our meeting that we could bring out some unification of effort in the various branches of the foundry industry. We believe that they certainly would give better results with a combined operation.

WALTER GERLINGER
Walter Gerlinger, Inc.
Milwaukee

STARTS SAFETY PROGRAM

Please advise me as to any safety regulations that foundries should be aware of and include in their safety manuals. We are starting to stress safety fundamentals in our chapter's program.

S. W. RICHARD
Vice-Chairman
AFS Piedmont Chapter

Editor's Note: Congratulations to you and the chapter for taking an interest in safety. A book list has been forwarded with appropriate manuals indicated.

TRENDS IN EDUCATION

H. F. Dietrich's column on "Engineering Alumni Tell Educational Needs" provokes some comments. Four points were mentioned in the survey. They are:

1. Form 1 to 5 years after graduation, the alumni felt that they had been cheated in practical courses.

2. From 5 to 15 years, they felt that they should have had more mathematics, physics, chemistry, and basic science.

3. From 15 to 25 years out of school they felt that public speaking, business organizations, finance, and labor relations should have been given more time.

4. Above 25 years, the graduate engineer felt that he should have had more education in music, literature, drama, and the fine arts.

These four points have been and

Conveyor: 1961

Pipe line routing serves to conserve the foundryman's most valuable asset: manpower and real estate, . . . by reducing the cost of handling his most expensive commodity: Sand

Can you afford to overlook the competitive advantages of reducing your sand handling costs?

Foundrymen who are aggressively waging the battle of cost vs. profit are winning—with National Air Conveyor Systems. Write for literature.

NATIONAL ENGINEERING COMPANY

630 Machinery Hall Building • Chicago 6, Illinois

FS61-R

Circle No. 130, Pages 137-138

Handling castings in Wirebounds cuts 7-10 hours per truck load

Foundries using Wirebound pallet boxes save 7 to 10 man hours per truck or carload over handling and shipping castings in conventional bags . . . man hours which add up to 30% savings in shipping labor for some foundries.

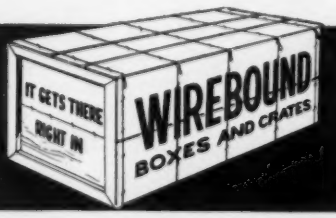
Besides eliminating the cost of filling and tying bags, Wirebound's large capacity and ease of handling contribute to better utilization of warehouse and loading space; simplify your order checking and inventory control.

Low cost expendable Wirebounds pay for themselves by eliminating the high cost of keeping track of returnable containers and the cost of return shipping.

Rugged Wirebound pallet boxes stack safely three and four high. They retain their natural strength even when stored outside, exposed to all types of weather.

Your customers realize savings, too, when you ship in Wirebounds. Their handling is minimized—no bags to open, no containers to return. Castings are accessible and easily identifiable at all times.

• To learn how Wirebound pallet boxes can help you realize savings, contact Wirebound box manufacturers or write to the address below.



WIREBOUND BOX
MANUFACTURERS ASSOCIATION INC.
222 W. Adams Street, Room 1495
Chicago 6, Illinois

1236

are well taken by engineering educators.

Starting in reverse order, I believe that you will find more courses required today in the field of social studies and humanities, than were required for those graduating over 25 years ago.

Perhaps this need has been partially filled, although at the time the engineering student studies the arts, drama, music, etc., he has little interest in these subjects. They are taken then as requirements, rather than subjects which will help to broaden him for greater enjoyment of later life. Perhaps they should be offered at a later time, when the graduate student can better appreciate their value.

As for group three, public speaking and report writing are becoming more stressed in the engineering field. While there is an introduction to business organization and labor-management relations, students generally feel that this is not of immediate concern, and again tend to concentrate on the more basic engineering subjects.

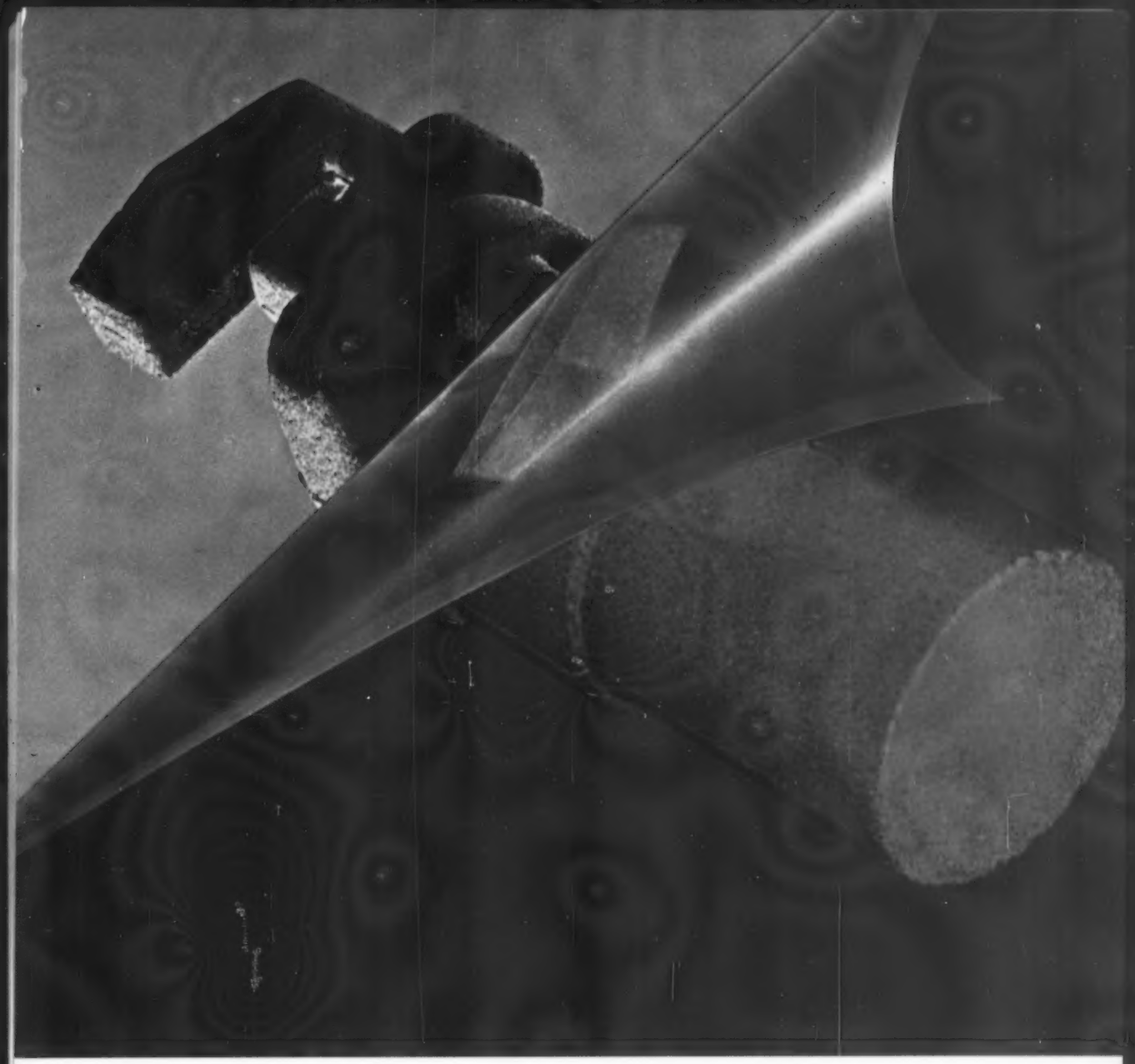
Engineering subjects are being taught now from a more and more basic approach, and are beginning to better fulfill the needs of the second group of graduates. It is to be hoped that students will appreciate the need for the basic sciences in this space age, and apply more concentration to the subjects now covered in the basic sciences.

Perhaps the greatest emphasis should be stressed on the needs of the new graduate. There should be some definition of practical knowledge, for it is outside the realm of the university education to give students the knowledge which will fully prepare him for a journeyman's card in any specific occupation.

We would like to define the practical knowledge as the means to apply given knowledge to specific instances and situations. Our tendency then is to veer from training students in the specific art of mold making, core making, lathe operation, drilling, and other specific processes. Rather we are trying to grant an approach to problems arising as a casting is produced, as parts fail and need improvement, or as metal is removed in a cutting operation.

Improvement of the industrial processes will have to come through the understanding of the basic principles of the materials, thermodynamics, and solid and fluid mechanics involved in that particular process. Our aims then are bent toward satisfaction of the graduate's needs in his industrial and public life.

As a teacher at an F.E.F. school,



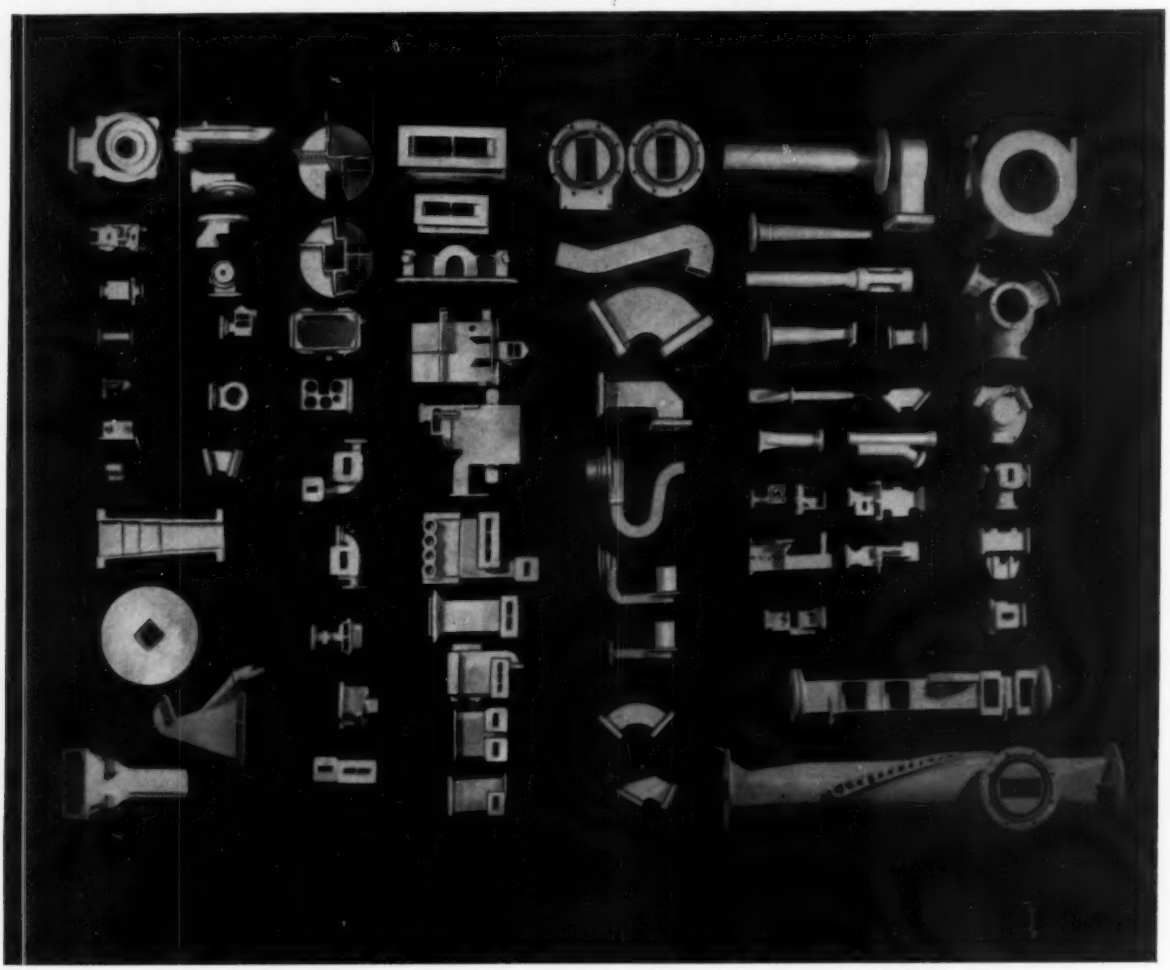
With cores as with photographs,
it takes a good negative to
make a good positive...

DEXOCOR®
and MOGUL®
binders

WRITE OR PHONE
Corn Products for expert technical assistance... helpful data on these fine products for Foundrymen:
DEXOCOR® • MOGUL® • KORDEK® • HYDRACOR® binders • GLOBE® dextrines.

CORN PRODUCTS COMPANY INDUSTRIAL DIVISION • 10 East 56 Street, New York 22, N. Y.

AFS MEMBERS...Welcome to San Francisco. For castings like these use the new Bestwall #1 Metal Casting Plaster



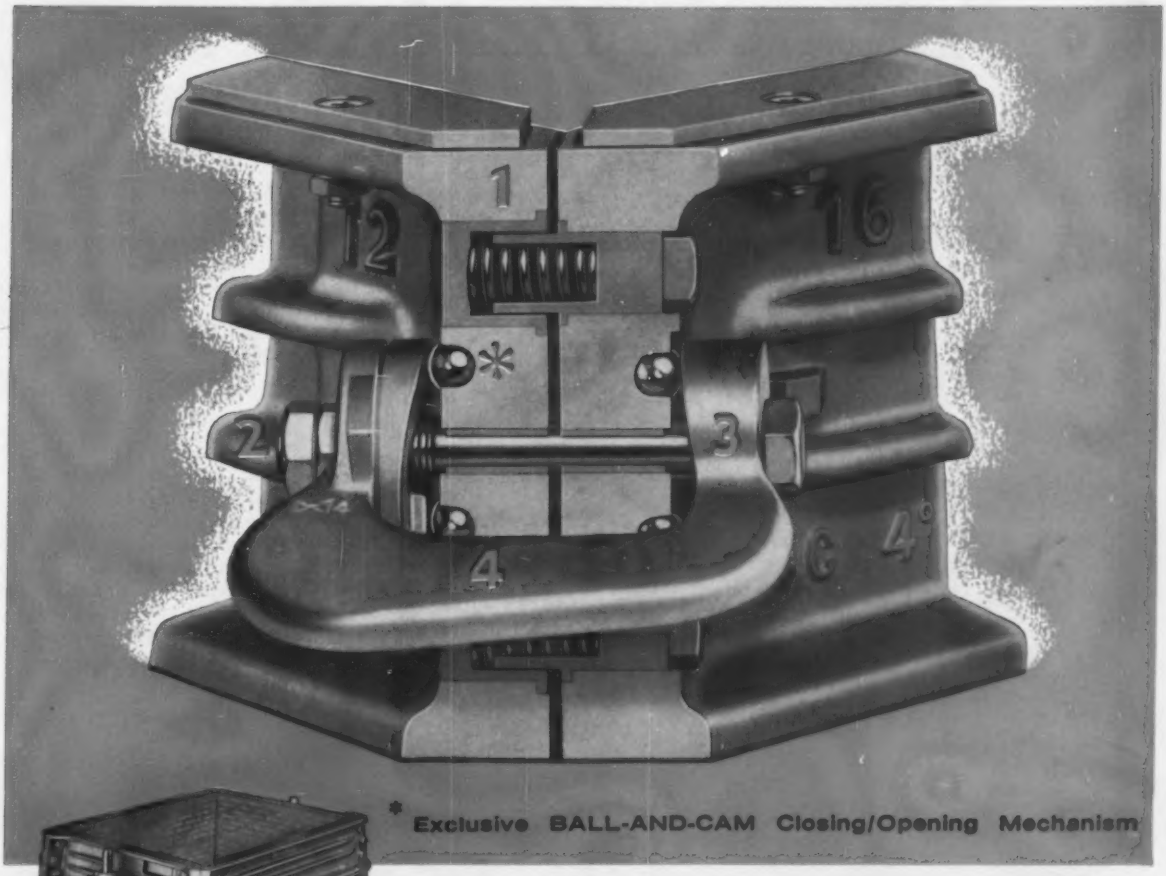
These castings—photographed at the Sims Casting Corp., Syracuse, N.Y.—are typical of those made with the new Bestwall #1 Metal Casting Plaster. If you are not already using this plaster for non-ferrous precision castings you should be. A few words will tell you why: *First,* with Bestwall #1 Metal Casting Plaster you can cast to a tolerance of .0025 inches per inch. *Second,* you can produce aluminum castings with a measured surface finish of .50 micro-inches. *Third,* it gives you the widest process size range of any precision casting material—from under 6" to over 36". It is the finest metal casting plaster ever developed. Prove this in your own plant! Bestwall Gypsum Co., Ardmore/Pa.

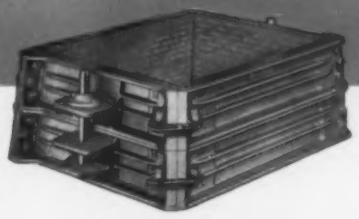
INDUSTRIAL BESTWALL GYPSUM PRODUCTS

Plants and Offices throughout the United States

Circle No. 132, Pages 137-138

New Snap-Flask Locking Device...





THE STERLING SlipSter

The New Sterling SlipSter offers precisely the advantages you want for your flask operations . . . ease of use, speed with quality production, minimum servicing. Whatever your requirements . . . single or double pin closing, hardened steel bushings, handles, trunnions and upsets . . . the SlipSter fills every need more efficiently.

Your Sterling representative will be glad to show how you and your foundry will benefit.

1. Shielded-spring sleeve design eliminates frequent lubrication and servicing.
2. Floating Cam provides easy 1-Point Servicing.
3. Easy operating Split Cam produces maximum opening.
4. Broad-faced handles assure instant, positive opening/closing.

Sterling WORLD WIDE SERVICE

STERLING NATIONAL INDUSTRIES, INC.

MILWAUKEE, WISCONSIN • ASSOCIATE: STERLING FOUNDRY SPECIALTIES LTD., LONDON • BEDFORD • JARROW-ON-TYNE, ENGLAND

Circle No. 133, Pages 137-138

Junior's high and happy,
The eager little waif;
With Kemco *Magnetism*
He knows he's very safe!

When you think of SILICON . . . think of KEMCO!

KEMCO SILVERY PIG IRON

SILICON METAL - OTHER FERROALLOYS

Handle by magnet, charge by weight, or count the pigs for equal accuracy.

Keokuk Electro-Metals CO.
Division of Vanadium Corporation of America
Keokuk, Iowa • Wenatchee, Washington

Sales Agent: Miller and Company
Chicago 4, Illinois, 332 S. Michigan Avenue
Cincinnati 2, Ohio, 3504 Carew Tower
St. Louis 5, Missouri, 8230 Forsyth Blvd.

The superior form of silicon introduction . . . available in 60 and 30 lb. pigs and 12½ lb. piglets . . . In regular analysis or alloyed with other elements. For uniform high purity, aluminum producers specify Kemco Silicon Metal.

Circle No. 134, Pages 137-138

and with an AFS student chapter, we have and are demonstrating our interest in supplying industry with acceptable graduates, and supplying graduates with the tools needed for success in his field.

Charles M. Phipps, Jr.
Asst. Prof. M.E. Dept.
University of Illinois
Urbana, Ill.

Editor's Note: I fail to see wherein we disagree. We both admit that our current education system leaves something to be desired. We seem to disagree on just what that might be. In the end, we who teach will do what the accrediting board suggests.
H. F. Dietrich

LIKES MALLEABLE ARTICLE

Congratulations on a very excellent article "New Applications Spur Malleable Iron Industry" in the March issue. I have had opportunities to hear many expressions from various foundrymen relative to this story and its impact. It has created wide interest and many contacts were made to me on methods and procedures.

Emil J. Romans
Canton Malleable Iron Co.
Canton, Ohio

WANTS MARKETING PROGRAM

I certainly agree with your comments in the March issue of Modern Castings on marketing and its profitable application to the metalcasting industry.

Possibly it would be a good thing to consider the formation of a foundry industry development association. This group could act as a public relations information center. An annual "mite" from each foundrymen to this center could unite in producing an excellent reaction toward uplifting of the foundry industry in the public eye. I think it is a good thing to remember that public reaction is reflected in every branch of engineering.

C. A. Parlanti
Natick, Mass.

U. S. PERMANENT MOLDING

We read with interest the article in the February issue of Modern Castings on the Russian manufacture of steel castings in permanent molds.

This process is not new in our country. We have been pouring steel and iron castings in permanent molds

Only on Shalco Shell Core/Mold Machines...

Gas or Electric core box heating...

your choice at no extra cost

Now, to meet your specific requirements, you can have either gas *or* electric core box heating on any Shalco shell core/mold machine . . . at no extra cost. In addition to this exclusive option, fully automatic Shalco machines offer . . . full design flexibility to accommodate the widest variety of cores and molds . . . adjustable cams for automatic blow in any position . . . thermostatic core box temperature control for accurate, uniform curing . . . rugged, precise construction for sustained, consistent performance. Whatever your needs in shell core, shell molding, shell sand coating and related equipment, Shalco can fill them. From machine selection on through the training of your operators, Shalco's unmatched engineering, manufacturing and service organization is at your disposal. CALL, WRITE OR WIRE FOR COMPLETE INFORMATION.

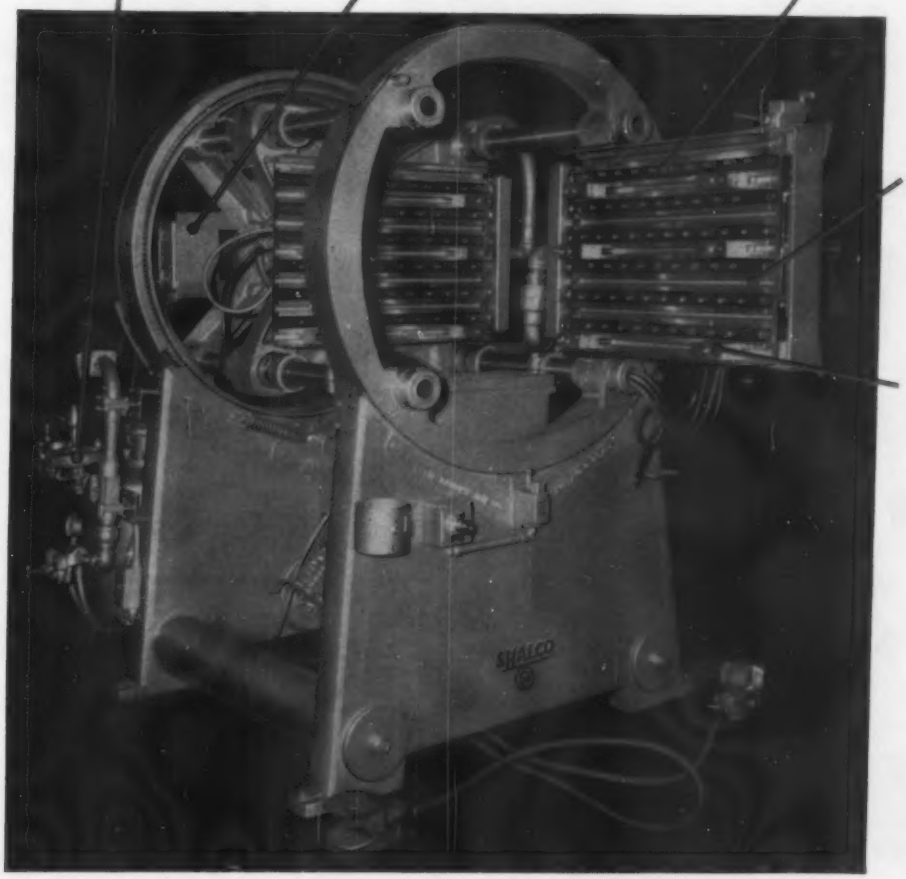
Shalco Division of
National Acme
THE NATIONAL ACME COMPANY
174 E. 131st STREET
CLEVELAND 8, OHIO

Sales Offices: Newark 2, N. J., Chicago 6, Ill., Detroit 27, Mich.
Licensee in the United Kingdom: Stone-Wallwork, Limited, London SW-1, England

. Gas Mixing Unit.

Thermostat heat control for high and low flame.

Manifolds arranged with removable blast tips which can be located to suit size of core box or heating requirements. Also, any complete line of tips can be shut off.

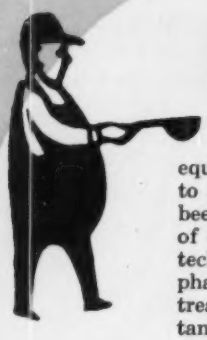


Back Plate complete with tee slots for block adjustment.

Adjustable blocks for securing core box—this allows for maximum area of box to be exposed to tips. Cold spots are eliminated with ample space available for tip lighting.

Circle No. 135, Pages 137-138

Wherever aluminum needs heat



Meet "Little Joe"! He looks something like a fellow in our plant but we really use him as a symbol of the good right hand of service Lindberg-Fisher's expert design staff and our complete line of "heat for aluminum" equipment is able to render you.

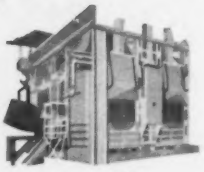
LINDBERG FISHER

You'll find this nameplate on all the equipment you'll need for applying heat to aluminum. Heat and aluminum have been Lindberg's babies for years. Our staff of expert engineers, metallurgists and technicians is widely experienced in all phases of aluminum melting, casting, and treating and has pioneered many important developments in aluminum processing by heat. Today, Lindberg offers you a complete line of heating equipment for every requirement in this field. This includes every needed type of melting, holding or heat treating furnace, large and small, shop built or field erected, fuel fired or electric (resistance, 60 cycle induction, arc or high frequency). We hope you'll let our symbolic friend, "Little Joe", guide you through the exposition of this equipment offered on these pages.

Hot Metal Delivery

MELTING

"RIGHT FROM THE START, LINDBERG EQUIPMENT TAKES OVER YOUR ALUMINUM HEATING NEEDS."

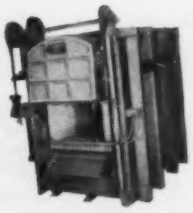


Fuel fired reverberatory. Charging well optional.

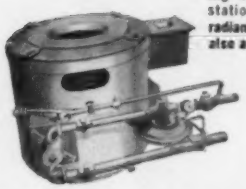
"MOLTEN METAL FROM REDUCTION CELLS IS HELD, OR INGOTS MELTED, IN FURNACES LIKE THESE."

CASTING STATION

"MOLTEN METAL IS HELD AT THE CORRECT TEMPERATURE UNTIL PROCESSED INTO CASTINGS."



Fuel fired reverberatory, holding or melting.



Fuel fired crucible or pot, holding or melting, stationary. **New radiant wall type also available.**

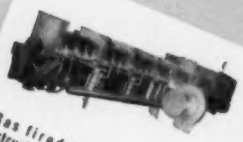
"MANY CASTING STATION FURNACES CAN BE EQUIPPED WITH THE LINDBERG AUTOLADLE, NAMED 'LITTLE JOE', AFTER ME."

Autoladle for automatic ladling, four shot sizes available, up to 100 lbs.

HYNI nitrogen generator, for atmosphere melting and fluxing.

SPECIAL EQUIPMENT

"SOME CASTINGS MAY REQUIRE HEAT TREATMENT AND THESE ARE HANDLED IN THE FURNACES BELOW."



Gas fired billet heater for extrusions.

"SO, DOWN TO THE FINISHED PRODUCT, LINDBERG EQUIPMENT TAKES CARE OF EVERY STEP."

HEAT

Cyclone heat treating, electric or fuel fired, box or pit.

Cyclone heat treating, electric or fuel fired, box or pit.

60 cycle induction billet heater for extrusions.

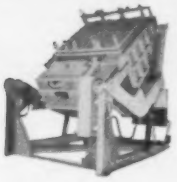
BILLETS RODS CASTINGS

LINDBERG equipment will apply it

AND HOLDING FURNACES

Key
Molten Metal
Solid Metal

Ingot



60 cycle two chamber induction, tilting.

Fuel fired double reverberatory. Especially suitable for alloying. Charging well optional.

60 cycle, two chamber induction, tilting; melting and holding.

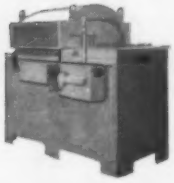
MELTING, HOLDING AND REMELT FURNACES

"AS REQUIRED, MOLTEN METAL IS TRANSFERRED TO FURNACES AT THE CASTING STATIONS."

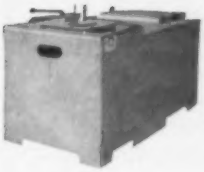
"INGOTS CAN ALSO BE MELTED AND HELD IN THESE FURNACES."

60 cycle induction coreless, tilting, ideal for melting chips.

Fuel fired, crucible or pot, tilting, melting.



Electric resistance, "radiant dome," reverberatory, holding.



60 cycle, two chamber induction, holding or melting, stationary.

Electric resistance, "radiant muffle," Dry-Hearth, melting and holding, nitrogen atmosphere.

Electric resistance, crucible or pot, holding or melting, stationary.

Fuel fired, Dry-Hearth, two chamber, holding or melting.

High frequency induction, tilting, melting.

"GATES, RISERS, SCRAP CASTINGS, ETC. GO BACK TO THE FURNACES AT THE RIGHT FOR REMELTING."

Fuel fired, Simplex, rotary, horizontal drum, melting.

"WHY NOT GET IN TOUCH WITH LINDBERG FOR YOUR ALUMINUM HEATING NEEDS? TELL THEM 'LITTLE JOE' SENT YOU."

TREATING FURNACES

Homogenizing cyclone heat treating, electric or fuel fired, box.

D. C. INGOTS

We'll be glad to discuss your aluminum processing needs with you. Get in touch with your local Lindberg Representative (see your classified phone book) or write us direct.

LINDBERG FISHER DIVISION

LINDBERG ENGINEERING COMPANY

2450 West Hubbard Street, Chicago 12, Illinois

Los Angeles plant: 11937 S. Regentview Avenue, Downey, California. In Canada: Birlefco-Lindberg Ltd., 15 Pelham Ave., Toronto 9, Ont. Also Lindberg plants in Argentina, Australia, England, France, Italy, Japan, South Africa, Spain, Switzerland, and West Germany.

H-25 PAYLOADER®

efficient sand handler

Buck Iron Co. Inc., in Buck, Pa., has a fine reputation for malleable iron, bronze and aluminum castings. This is a job foundry specializing in marine hardware.

Several years ago this firm bought an HA PAYLOADER tractor-shovel of 2,000-lb. operating capacity to handle the materials for both its iron and bronze castings. Late in 1960, another PAYLOADER was added. This time they selected the larger capacity (2,500-lbs.) Model H-25.

Sand handling is the principal job of these two units. This entails moving about 150-tons twice during the operation, working within 150-ft. of the shaker. They windrow the sand after shakeout, haul it to the shaker and, later, redistribute it from stockpile to 26 molding stations.

Vice President L. A. Dunn reported being *"very well pleased"* with the performance and production of the two loaders. He added that he *"particularly liked the ruggedness and dependability of the H-25."*

Satisfactory performance on the part of the H-25 is no accident. Its superior basic design includes mechanical features that provide speed, mobility and operating ease . . . such as, its short 6-ft. turning radius aided by power steering, its *complete* power-shift transmission with matching torque converter, power-transfer differential and fast, powerful hydraulic bucket control.

Dependable operation. The H-25 has "extra protection" built into it to withstand rugged duty . . . a closed, pressure-controlled hydraulic system *plus* special filters and seals throughout the machine to protect mechanical and electrical parts from damage due to dust, moisture and corrosion.

You will find that an H-25 in your operation will pay for itself very quickly through savings in increased output and lower costs. A nearby Hough Distributor is ready to demonstrate.

HOUGH®

THE FRANK G. HOUGH CO.
711 Sunnyside Avenue
LIBERTYVILLE, ILLINOIS
SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY

Send PAYLOADER bulletin "Industrial Material Handling from A to Z".

Name _____
Title _____
Company _____
Street _____
City _____
State _____

5-A-4

Circle No. 137, Pages 137-138

for years. In fact, this process is about 25 years old. We have developed a permanent mold machine that produces manhole castings weighing 200 pounds at the rate of one every 12 minutes.

It won't be long until we see any type of production castings produced in permanent molds.

MATTHEW WAGNER
Wagner Permanent Mold Co.
Burbank, Calif.

NEED MORE TECHNICIANS

Despite a de-emphasis on student technical training in some quarters, a concentrated effort on this point is continuing at Wentworth Institute. This training fills a gap that is developing in education.

Engineers trained in basic sciences and engineering sciences are certainly needed, and the person who does graduate study in foundry can make many worth while contributions to the development of casting knowledge. However, in the mean time, someone must fill the widening gap to carry on the daily work of a technical nature.

The foundry technician must be recognized for his place in the cast metals industry. With the continuing trend toward mechanization, someone with a good technical background must fill the gap between the machine operators and the engineering staff. That person who will be able to converse in an engineering language to promote development of the cast metals industry is the engineering technician.

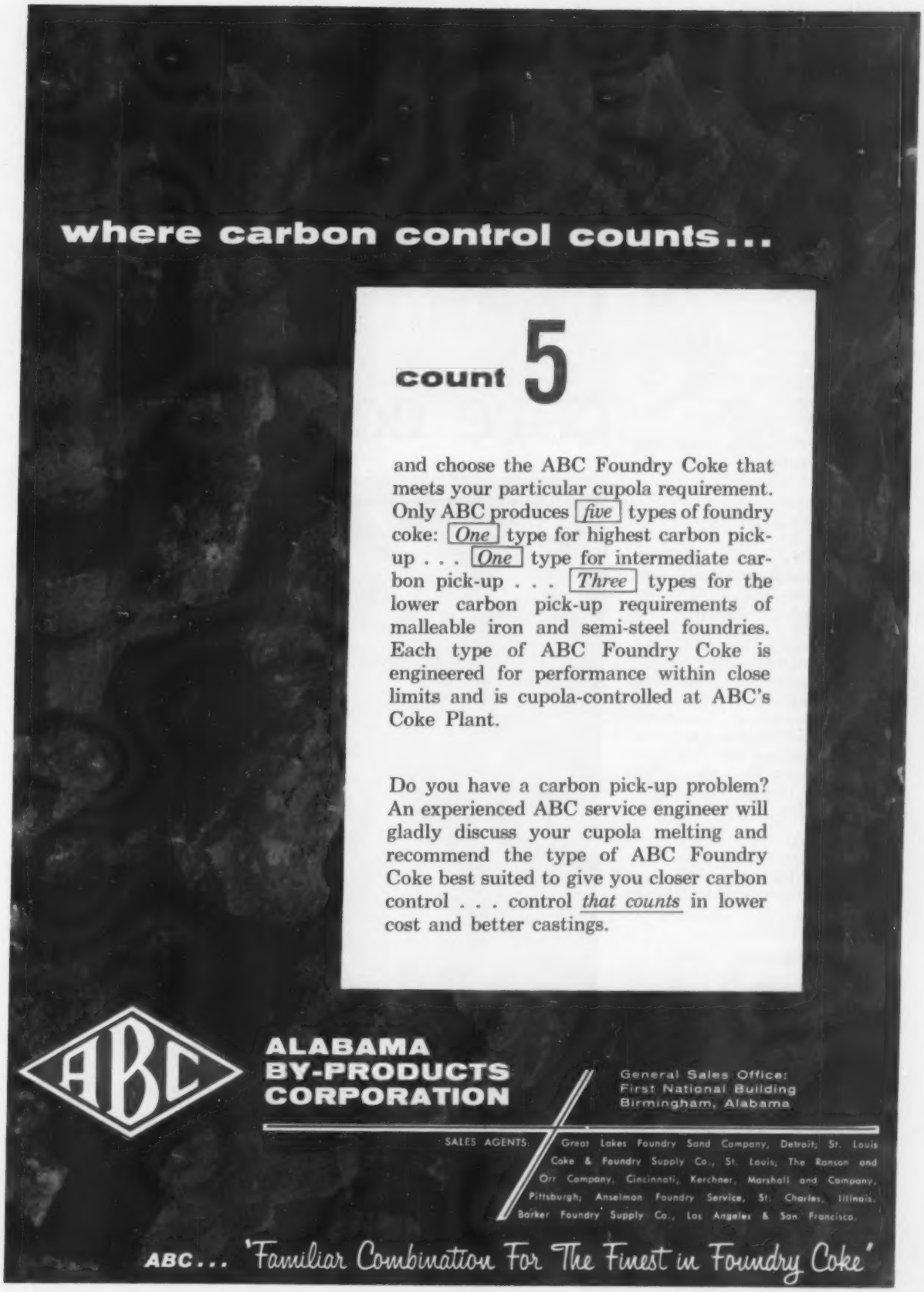
J. GERIN SYLVIA
Senior Instructor
Wentworth Institute
Boston

CORE MOVEMENT LIMITS

What information have you regarding the maintaining of core float or movement in various malleable casting sizes? Are there any standards or suggested tolerances available on core movement?

J. C.

Editor's Note: Normally, the dimensional tolerance when made in green sand will be on the order of plus or minus 3/64 in. per foot. In order to accomplish nicety of dimensional reproduction, it of course is necessary to have very accurate, sturdy metal pattern equipment and flasks which are accurately made with carefully protected flask pins and flask mating


where carbon control counts...
count 5
and choose the ABC Foundry Coke that meets your particular cupola requirement. Only ABC produces five types of foundry coke: One type for highest carbon pick-up . . . One type for intermediate carbon pick-up . . . Three types for the lower carbon pick-up requirements of malleable iron and semi-steel foundries. Each type of ABC Foundry Coke is engineered for performance within close limits and is cupola-controlled at ABC's Coke Plant.
Do you have a carbon pick-up problem? An experienced ABC service engineer will gladly discuss your cupola melting and recommend the type of ABC Foundry Coke best suited to give you closer carbon control . . . control that counts in lower cost and better castings.
ABC
ALABAMA BY-PRODUCTS CORPORATION
General Sales Office:
First National Building
Birmingham, Alabama
SALES AGENTS
Great Lakes Foundry Sand Company, Detroit; St. Louis Coke & Foundry Supply Co., St. Louis; The Ranson and Orr Company, Cincinnati, Kerchner, Marshall and Company, Pittsburgh; Anselman Foundry Service, St. Charles, Illinois. Barker Foundry Supply Co., Los Angeles & San Francisco.
ABC... 'Familiar Combination For The Finest in Foundry Coke'

surfaces. In addition there must be good molding with sand uniformly rammed to a comparatively high hardness values.

WILL REPRINT ARTICLE

We have read with great interest the article by Bill Walkins, Esco Corp., Portland, Ore., appearing in the January issue under the title "How to Operate a Successful Suggestion System."

As chairman of the editorial board of the National Association of Suggestion Systems *Quarterly* I am asking on behalf of the board for permission to reprint this article in the fall issue.

WALLACE H. EGBERT
Chairman, Editorial Board
Secretary, N.A.S.S.

Editor's Note: We gladly extend our permission to reprint this article.

MANY F.E.F. AUTHORS

I had a feeling that Foundry Educational Foundation graduates have been making significant contributions to the technical literature of the industry. However, I never realized how much until I took a close look at the index of the April MODERN CASTINGS.

Five former F.E.F. scholarship holders were represented—John Varga, Jr., Henry Kunsmann, Thomas W. Mueller, James Widmoyer, and Arthur Zrimsek. In addition, two "key" professors are among the authors, Dick Flinn of the University of Michigan, and Dick Heine of Wisconsin University.

E. J. WALSH
Executive Director
Foundry Educational Foundation

SOUTH AFRICAN REQUEST

As an AFS member I am an avid reader of MODERN CASTINGS. I am particularly interested in the article "New Sand Practices Produce Five-Way Profits" appearing in the February issue. This deals with new sand practices developed at Kensington Steel Co., Chicago.

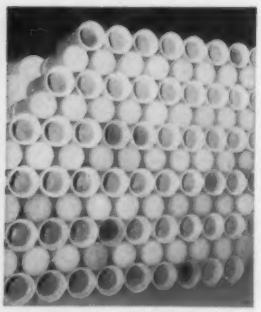
We seem to be a foundry with similar interests to that of Kensington. Half our production roughly is Hadfield manganese steel quality in mantles, bowl liners, jaws, etc. Our firm, Union Steel Corp. (of South Africa) We ship about 350 tons of this quality steel monthly.

Do you think they will be prepared

Foundry trims core costs by 1/3

More castings. Finer castings. *Castings that cost less to make.* That's the story in foundry after foundry where they use shell cores bonded with Durez foundry resins.

Once it took sixteen men to make oil sand cores at Lake Erie Foundry Company, Inc., Girard, Pa. A switch to shell cores made it possible to move ten of these men into more productive jobs elsewhere in the foundry. The remaining six men now turn out more cores than ever—and that's only the beginning of this foundry's savings.



EASY TO STORE. Cores now have smoother faces and come closer to specified tolerances. That saves costly machining. These cores can be piled

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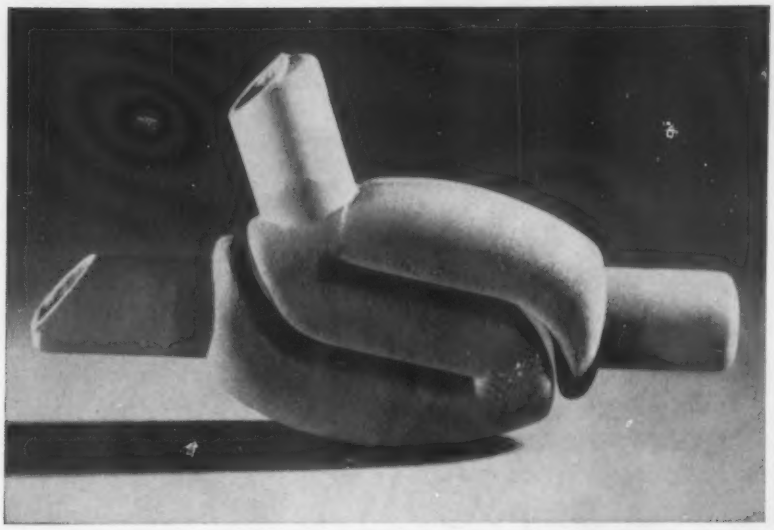

up in stacks for storage—a big saving in space. They're much easier to lift and move than solid sand cores. They don't have to be baked; they come out of the core box ready for setting and pouring. Altogether, the shell cores now cost *one-third less* than before.

"Durez resin has played an important part in helping us make these savings," declares Ford Daugherty, superintendent at Lake Erie Foundry. "Its drum-to-drum consistency enables us to keep product quality high. Durez representatives have helped us make major savings by reducing resin content of our cores to a very low percentage."

YOU, TOO? Can shell cores help your foundry show results like these? Your Durez representative will gladly help you look into the matter. His know-how can save time and expense. See him soon.

DUREZ PLASTICS DIVISION
8905 WALCK ROAD, NORTH TONAWANDA, N. Y.

HOOKER CHEMICAL CORPORATION

HOOKER CHEMICALS PLASTICS

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to correspond with us directly on the technical side of the article?

RICHARD TAIT
Assistant Foundry Manager
Union Steel Corp. (of S. A.) Ltd.
Vereeniging, South Africa

REPLY ON NEW CONCEPTS

We sympathize with A. G. Johnston's attempt to rationalize and find significance in high temperature testing in his comments which appeared in the January issue of MODERN CASTINGS.

As stated in our article "A New Concept for Hot Sand Properties" in the November issue of MODERN CASTINGS we feel it is a completely logical assumption that the properties of sands at elevated temperature are somehow related to casting results. However logical this assumption might be, we cannot see any positive correlation between hot properties and casting results. As a quality control test to assure day to day uniformity of proven sand formulations, the elevated temperature test perhaps serves a purpose. It would seem, however, that green and dry property tests are simpler and less costly.

Turning to some of the specific arguments presented by Mr. Johnston, we find we disagree thoroughly with them with the exception of one. We would agree with his inference that the dry or baked strength of core sands is more significant than hot strength. Even at that, the significance is vague although less so than the significance of hot strength.

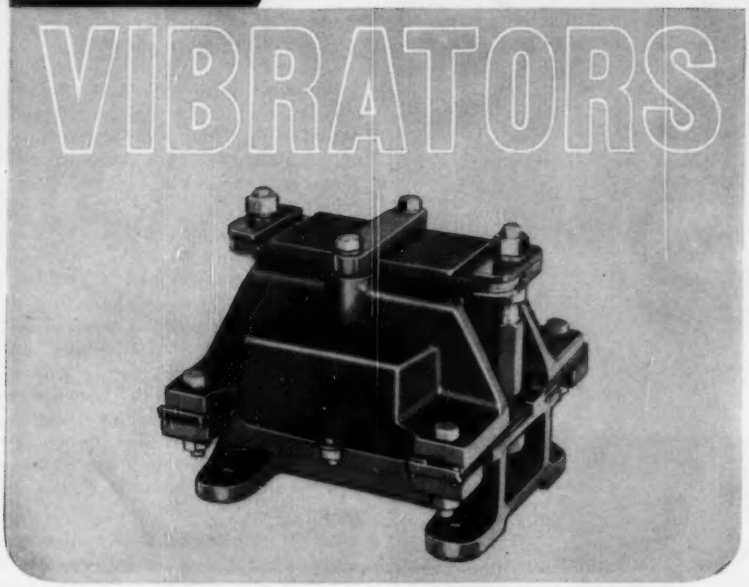
Metal penetration does not occur as a result of low hot strength in cores but instead because of large pore size between sand grains. It is coincidence that addition of materials such as silica flour and iron oxide which reduce the average pore size substantially also increase hot strength of some formulations.

Hot strength of core sands can also be reduced by silica flour additions if the oil content is decreased. The reduced hot strength is not accompanied by loss of the anti-penetration quality. A simple density test of the core is more significant than hot strength when related to penetration.

Mr. Johnston's conception of the thermal expansion of silica, carbon, concrete, and glass is completely in error. The thermal expansion of quartz is more than 10 times less that of graphite, glass, and concrete. The ex-

KEEP BULK MATERIALS FLOWING FREELY

SYNTRON ELECTRIC VIBRATORS



ASSURE STEADY MATERIALS FLOW FROM BINS, HOPPERS, CHUTES

Syntron builds an Electromagnetic Bin Vibrator unit to meet almost every requirement. Prevents most types of bulk materials from arching or plugging in bins, hoppers, and chutes.

The Electromagnetic drive unit produces 3600 instantly controllable vibrations per minute, providing a steady materials flow to processing equipment.

Every Syntron Electromagnetic Bin Vibrator is rugged and durable. The absence of mechanical moving parts assures long, trouble-free service with very little maintenance.

Keep bulk materials flowing efficiently and economically.

Write for a Syntron Catalog and the name of the representative nearest you.

Write for a Syntron Catalog and the name of the representative nearest you.

V-55 on weigh hopper

61V3

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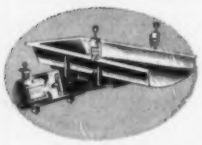
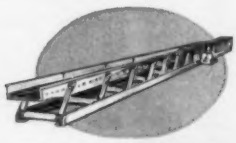


Vibratory Feeders



Mechanical Vibrating Conveyors

Hopper Level Switches

pansion figures for each materials are as follows:

Quartz—0.585 x 10^{-6} inches per inch

Graphite—7.86 x 10^{-6} inches per inch

Concrete—10.14 x 10^{-6} inches per inch

At this point we would like to restate our conviction that the most logical of our sand testing methods (elevated temperature tests) has failed to give data which correlates positively with castings results. Sand engineers and technicians must face reality and admit that the knowledge about foundry sands is extremely limited. The key which will allow accurate prediction of casting results from sand test data which has not been found.

Arthur H. Zrimsek
George J. Vingas
Magnet Cove Barium Corp.
Arlington Heights, Ill.

MORE ON ALLOY A132

In the March issue of Modern Castings there was an item on page 26 captioned "Pistons to Furniture?" I would like to clarify and elaborate on some pertinent details which foundrymen know about aluminum alloy A132.

The alloy not only contains the mentioned silicon and magnesium, but also contains copper and nickel. Because of its composition, the resistance to corrosion would make the alloy quite unsuitable for the production of ornamental furniture castings.

The statement that alloy A132 will become brittle with room temperature aging is not correct, although it is true that this alloy in the as-cast condition will have low ductility. The recommendation of heat treatment is misleading because of manufacturer of sand cast ornamental furniture generally would design to avoid the cost of heat treatment.

Also, the solution heat treatment of all aluminum alloys is performed at temperatures much higher than 450-475 F. Heating in this temperature range would cause precipitation hardening. In addition, this is too high a temperature range for most commercial aging treatments.

Walter E. Sicha
Aluminum Co. of America
Cleveland

Editor's Note: Thank you for providing our readers with the additional important information. Converting pistons to furniture evidently is not as easy as beating swords into plowshares.

FIVE-DEEP

Traveling four times as far as the moon

to help you profit with UCM's "FIVE-DEEP" Ferroalloys

1 Customer Service, ready as your phone, brings Union Carbide Metals' field engineers to your melting plant—from any of 9 sales and service offices. In providing on-the-scene assistance, they gladly make available UCM's integrated experience in the application of ferroalloys to various melting practices.

Lately, their travels to mills and foundries have soared to well beyond the million-mile mark—each year! This customer service is just one of the 5 intangible but ever-present extra values of UCM's FIVE-DEEP alloys which mean better products and bigger profits for you. The others:

2 Technology—many million dollars worth a year—helps you produce better, more profitable metals. UCM's 600-man research and development center is the birthplace of hundreds of new alloys.

3 Unmatched Facilities free you from delivery worries. Only UCM gives you 6 plants—3 with their own power facilities—and 17 warehouses, all located for fast shipments by rail, truck, or water.

4 Global Ore Sources assure you uninterrupted supplies of ferroalloys. UCM's close association with world-wide mines provides dependable raw material sources.

5 Strictest Quality Control—with over 100,000 tests per month from mines to shipment—makes sure you always get alloys of uniform size and analysis, with minimum fines, lot after lot.

For better metals, production economies, bigger profits, insist on UCM's FIVE-DEEP alloys. Union Carbide Metals Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y., producer of "Electromet" brand metallurgical products.

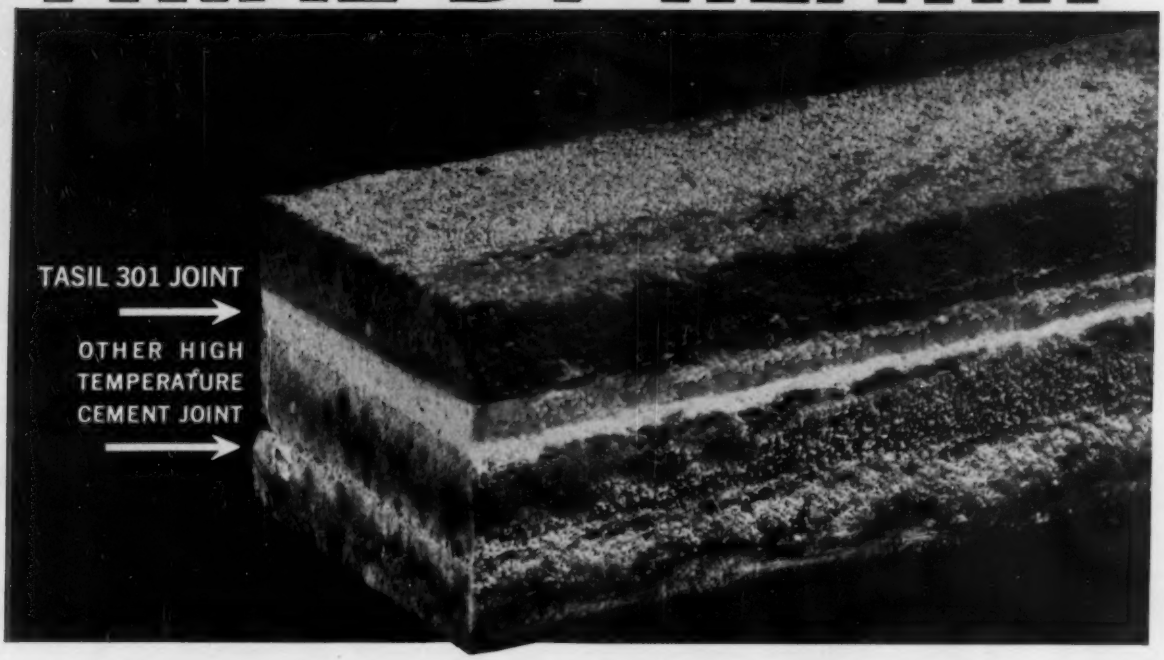
"Union Carbide" and "Electromet" are registered trade marks of Union Carbide Corporation.

UNION CARBIDE METALS

Only ELECTROMET ferroalloys from UCM are so deep in extra values to help you.

Circle No. 141, Pages 137-138

TRIAL BY HEAT...



Superior Refractoriness of TASIL 301 Cement proved by severe test

TEST DETAILS...

Three slices of TAMUL brick were cemented together with approximately ¼" thick joints — one of TASIL 301 Cement, the other a widely used air-setting high temperature cement. After drying, an 11-lb. brick was placed on top of the specimen which was then put in a laboratory re-heat furnace. The specimen was fired to 3000° for five hours, then allowed to cool. The brick was then sectioned, as shown.

Get TASIL Special Refractory Cements in the form you prefer:

No. 301 Air-Setting Cement — ready-mixed in drums.

No. 317 Air-Setting Cement — dry in bags.

No. 302 Heat-Setting Cement — dry in bags.

After five hours at 3000° temperature, the TASIL mortar in this test "sandwich" was unaffected. In the other joint, the cement has melted and run out—permitting the brick to press completely together.

New improved TASIL 301 Cement was developed to pass these specifications:

- **Superior refractoriness . . . high bonding strength . . . improved workability . . . minimum shrinkage at high temperatures . . . maximum resistance to slagging and erosion . . . ability to stay in suspension.**

Get maximum joint protection by using TASIL 301 Cement for your next furnace rebuild.

Call in your Taylor Field Engineer, or write direct for details.

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Circle No. 142, Pages 137-138

REVERE PRIMARY ALUMINUM

FOR FOUNDRY AND DIE CASTING USES

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As a buyer of Revere Primary Aluminum through Asarco's Federated Metals Division, you receive more than a quality product shipped without delay. You also get on-the-spot advice and guidance on your casting problems from Field Metallurgists with knowledge in depth concerning aluminum technology. This service is available to you and also to your customers. These field consultants are specialists backed by the scientific staff and complete facilities of Asarco's Central Research Laboratories. Revere Primary Aluminum, in all the standard alloys, is available to you in exact quality and quantity you specify without costly delays, because Federated maintains a national network of conveniently located sales offices and stockpoints.

Write to American Smelting and Refining Company, 120 Broadway, New York 5, New York, for your copy of Bulletin 195, "Revere Aluminum for the Casting Industry."

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Circle No. 143, Pages 137-138

How the Foundry Industry Serves America . . . #14 of a Series

SHOULD A MATERIAL BE LIGHT OR RIGHT?

The properties of cast iron make it practically ideal for a great many uses. Why "practically" ideal? Because the industry has heard a lot of promotion and commotion about just one thing lately—and that's *weight*. But the importance of saving weight is relative; the ability to do the job comes first. Otherwise cars, and coins, could be made of wood or feathers or cork.

For example, why take a part made of a hard, dense material like cast iron—with its high tensile strength and ability to stand up to extremes of heat, vibration and friction without getting tired—and substitute another, more expensive material (with fewer of these characteristics) *simply because it is not as heavy?* Replacing the right material with a lighter one could affect production costs so that the pounds saved would be the most expensive pounds of all!

Since customers today are demanding *more* dependability and many manufacturers have *lengthened* warranty periods, is this the time to trade long life for high-priced lightness?

Leading engineers and designers, along with their colleagues in the iron foundry industry, believe that this is the time to use materials with the natural characteristics best suited to the job, and make *them* as light as possible through design and engineering. Together, they have already developed iron castings that reduce vehicle weight—economically.

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THE KNOWN NAME IN IRON

THE HANNA FURNACE CORPORATION
Suppliers of quality pig iron to the American foundry industry
Boston • Buffalo • Chicago • Detroit • New York • Philadelphia
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TRENDS IN EDUCATION

Communications . . . An Industrial Headache

By R. E. Betterley

If you have read the first three columns of this series (I hope you have), perhaps the mere thought of the word "Communications" gives you a headache. However, if such is the case, I'm certain you realize the magnitude of the communication problem in industry today.

As expressed earlier, communication means the sharing of a thought or idea. The problem of the communicator is to fabricate his thinking into words and actions. These words and actions are then unscrambled by the receiver into meanings, *based upon his own experience and interpretation*. This is as complex as it sounds. The picture created by the sender can be greatly distorted by surrounding tensions, actions and conditions.

Furthermore, the receiver is working under entirely *different* tensions, experiences, and conditions. The mental picture *he* receives may really become distorted from the *original concept* of the sender. If the receiver attempts to repeat his understanding, the problem is evident: The transmitter sends an inaccurate message; the listener receives it more inaccurately. Then the receiver interprets it in terms of his life experiences. Subconsciously, he may ask, "Is this what he intended to say?" "What did he mean?"

How can you sharpen your communicating? There are several basic considerations. The sender can: (1) Develop a clear picture of *what* is to be conveyed and how he intends to do it; (2) Be cognizant of forces and tensions affecting him and the receiver—by putting himself in the receiver's shoes; (3) Develop clarity and brevity in written or spoken words. Avoid dangerous assumptions and write to *express* not impress; (4) In spoken communications, avoid having "minor" distractions eventually dominate the "major" (message to be conveyed). Some "button-twisting" public speakers may be glad to see the return of the vest with a suit, but alas, communications will suffer; (5) Make advantageous use of audio-visual aids and action; (6) Communicate with sincerity; (7) Phrase information in more than one way—show examples; (8) Re-read and edit written communications after a "cooling-off" period; (9) Have a *common* reference point with the receiver, e.g.—nomenclature, language, vocabulary, etc., and (10) Close with: "Do I make myself clear?" rather than "Are there any questions?" Then if there are questions, this puts the blame on *the sender*.

The receiver, in turn, can: (1) Be aware of tensions and obstacles to understanding; (2) Attempt to see through the sender's distortion; (3) Re-state information received in his own words. If not clear, ask clarifying questions; (4) Avoid developing a closed mind before sufficient data have been presented; (5) Be receptive to new ideas. There isn't such a thing as a "know-it-all" even though many act the part; (6) Avoid arguing irrelevant details and yield on unimportant items; (7) Listen, if the listener, and don't be a talker; (8) Pay strict attention to information. Pre-occupation hampers communications; (9) Key himself for the "what" and the "why" in the communication, and (10) Seek points of agreement.

In industry, employees can best develop a feeling of belonging and security when plant communications are complete and sincere. Communication between management, supervision, and employees should be an open channel, with the supervisor playing a vital link in the chain. Employees become more productive, creative, and cooperative when high morale exists because of sound communications.

Companies with personnel problems should carefully examine communication methods and procedures. Putting it in limerick form, we might conclude:

If one were to make propositions
To improve management's employee relations,
I would be quick to suggest
They strive for the best:
Through better communications.

Knight LETTER

SIXTH OF A SERIES

To: Foundry Management

Subject: Foundry Mechanization and Automation

The Knight organization, as you may know, engineered the first fully automated foundry in the United States in 1951. It is producing at the rate of 276 molds per hour with high speed production achieved through semi or fully automatic equipment.

Today's competition makes professional engineering assistance more helpful than ever to foundries. A manufacturing approach, for example, involving segmented and composite patterns offers the most economical production and lowest costs. In one instance, a recent study showed 118 different castings produced, with annual requirements from 1,000 to 105,000 pieces, by using just 30 segmented and composite patterns.

This approach supplies maximum flexibility for scheduling, standardization in one size of flask, and minimum pattern cost. It permits production techniques to be applied to jobbing and jobbing production requirements. In another case, two units replaced eight for the same volume of castings, with a reduction in total man hours per ton of 50%.

For your foundry to be competitive today and tomorrow, planned modernization is essential.

Lester B. Knight

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Foundry Engineering • Construction Management • Modernization • Mechanization • Automation • Survey of Facilities • Materials Handling • Methods • Industrial Engineering • Wage Incentives • Cost Control • Standard Costs • Flexible Budgeting • Production Control • Organization • Marketing

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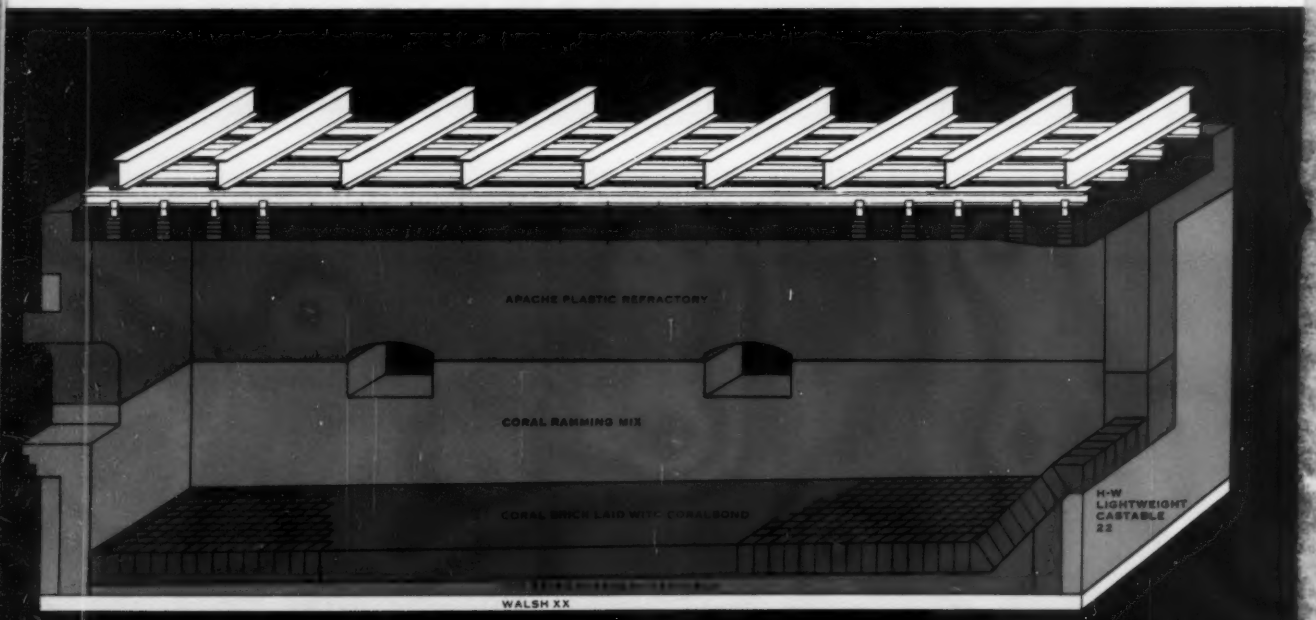
Circle No. 145, Pages 137-138

THIS HIGHLY SUCCESSFUL ALUMINUM MELTING FURNACE FEATURING MONOLITHIC CONSTRUCTION WAS BUILT ENTIRELY OF HARBISON - WALKER REFRACTORIES.

Construction and product details are given on the following page. PHOTO: COURTESY OLIN-MATHIESON CHEMICAL CORPORATION

CORAL BRICK, CORALBOND AND CORAL RAMMING MIX WERE ESPECIALLY DEVELOPED BY HARBISON-WALKER FOR ALUMINUM MELTING FURNACES. THEY HAVE ALREADY DEMONSTRATED UNUSUAL RESISTANCE TO PENETRATION AND CORROSION BY ALUMINUM ALLOY REACTION . . . AS WELL AS TO THERMAL SHOCK, SPALLING CONDITIONS, AND SEVERE IMPACT AND ABRASION. THE REFRACTORY USED IN EACH FURNACE SECTION WAS SELECTED TO ASSURE THE BEST BALANCED SERVICE LIFE.



WALSH XX

A strong, power pressed, high duty fireclay brick.

H-W EXTRA STRENGTH CASTABLE

A refractory concrete of outstanding physical strength.

CORAL brick, laid with CORALBOND

These specialized high-alumina brick and mortar have exceptional high strength to withstand spalling and slagging influences, and provide remarkable resistance to molten metal reaction.

CORAL RAMMING MIX

This companion product to CORAL brick and CORALBOND, installed by gunning or ramming, has excellent resistance to molten aluminum alloys and develops great strength at operating temperatures.

H-W LIGHTWEIGHT CASTABLE 22

An insulating monolith.

APACHE PLASTIC REFRACTORY

A high alumina (60%) monolith with refractoriness equal to brick of this class but with much lower permeability.

WRITE FOR DATA — Complete product descriptions and test data are available showing the superior resistance of these refractories to aluminum alloy reaction.

HARBISON-WALKER REFRACTORIES COMPANY AND SUBSIDIARIES

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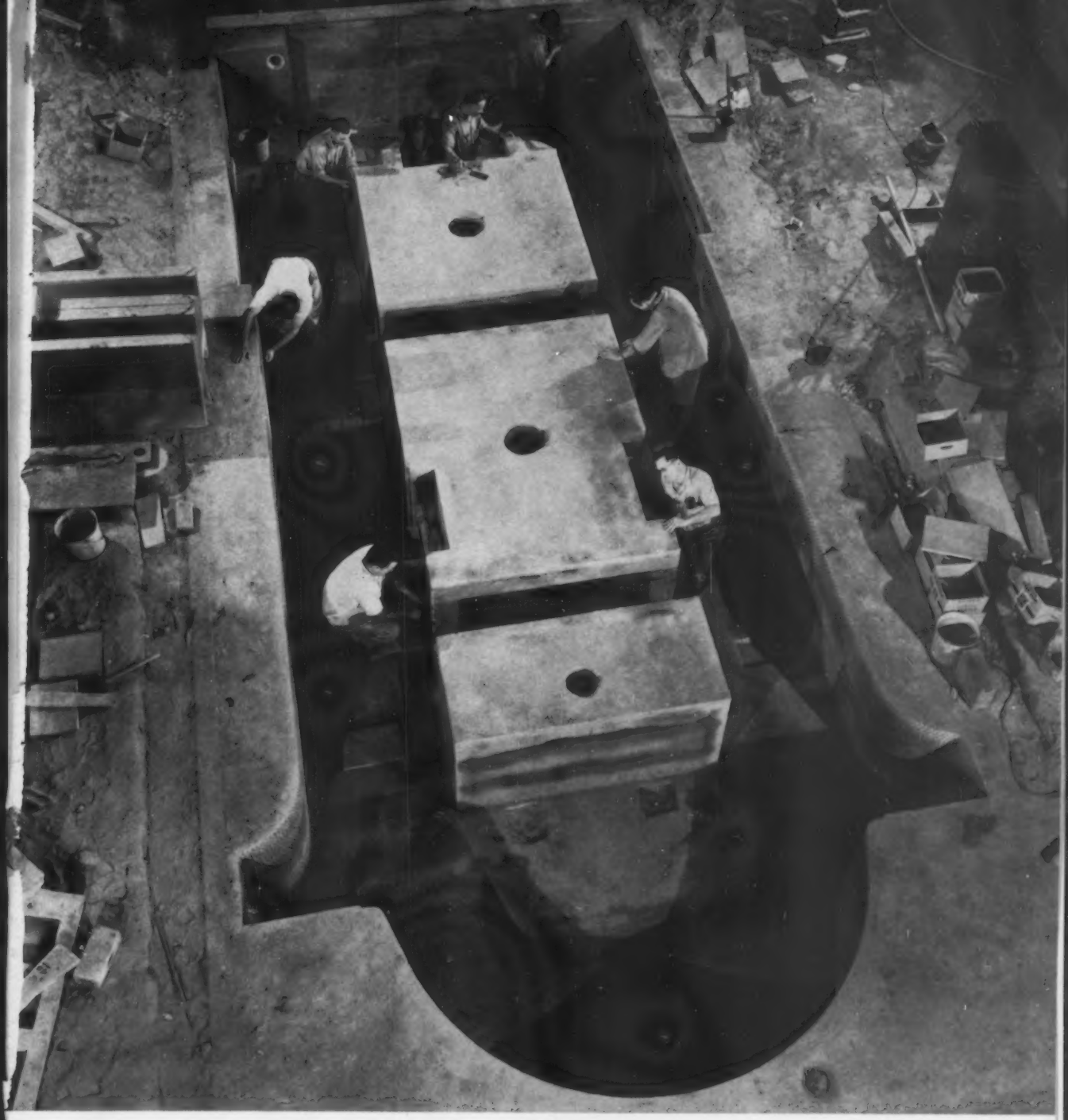
World's Most Complete Refractories Service

HW 61-7



The cores and this mold for a 426,000 lb steel casting were made by Mesta Machine Company with Venango sand — one of 35 grades of foundry sand available from Pennsylvania Glass Sand Corporation. Next time you need sand or silica flour for any casting requirement, contact PGS.

PENNSYLVANIA GLASS SAND CORPORATION

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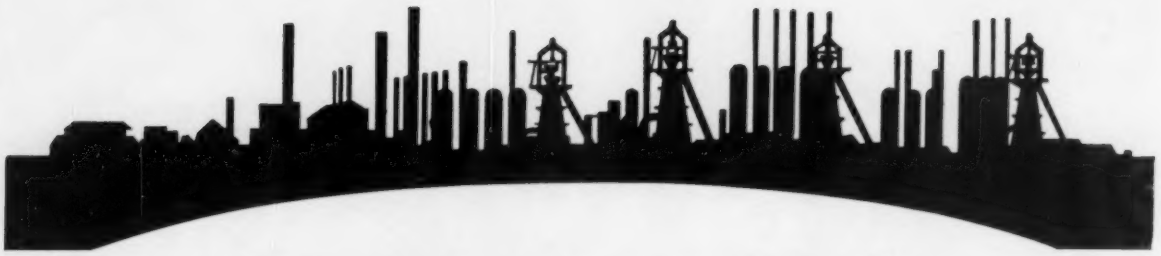

Woodward Iron Grades Are Flexible and Diversified

Flexibility and diversity of Woodward iron grades is widely known throughout the foundry industry. This table shows:

Woodward Pig Iron—Typical Grades

GRADE	SILICON	SULFUR	PHOSPHORUS	MANGANESE
Basic	Up to 1.50% (as ordered)	0.05% Max.	0.10-0.30 or 0.30-0.70 or 0.70-0.80% (as ordered)	0.40-2.00% (as ordered)
Malleable	1.00 to 3.50% (as ordered)	0.05% Max.	0.10-0.30%	0.20-2.00% (as ordered)
Foundry	1.00 to 3.50% (as ordered)	0.05% Max.	0.301-0.70% (as ordered)	0.20-1.50% (as ordered)
Foundry (High Phos.)	0.75 to 3.50% (as ordered)	0.05% Max.	0.70-0.90% Up to 1.50% (as ordered)	0.20-1.50% (as ordered)

Woodward also produces irons for operations requiring special analyses due to their particular application to out-of-the-ordinary types of casting. Whatever type of quality iron your company requires, you can be sure that Woodward can meet your specifications.

For quotations, write or call our Sales Department, Woodward, Ala.

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WOODWARD IRON COMPANY

WOODWARD IRON COMPANY

WOODWARD, ALABAMA

Independent Since 1882

Circle No. 148, Pages 137-138

In iron foundries today the trend is to...

NATIONAL
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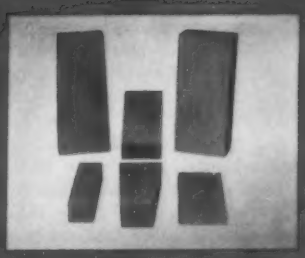
CARBON AND GRAPHITE PRODUCTS

When your operations require refractories to handle molten irons either inside or outside the cupola, you'll realize economic advantages when you use "National" carbon and graphite products. Why? Because carbon and graphite have no melting point... resist slag and thermal shock... are not wet by molten irons... have low thermal expansion... increase in strength with increase in temperature.

Whether you use carbon block and brick for lining cupolas and runout troughs... carbon paste for patching ... graphite tubes for injection and upgrading of iron... graphite plungers for producing ductile iron... or core rods and chill plates—you'll find these products all help reduce maintenance, speed production and lower overall costs. For details write National Carbon Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. In Canada: Union Carbide Canada Limited, Toronto.

CARBON BLOCKS—Provide long refractory life in the cupola.



CARBON BRICK AND PASTE—Proved materials for cupolas and runout troughs.

GRAPHITE TUBES—Unsurpassed for introducing graphite powder for injection and upgrading of gray iron.

"National" and "Union Carbide" are registered trade-marks for products of

NATIONAL CARBON COMPANY

UNION CARBIDE

Circle No. 149, Pages 137-138

Serendipity—Big Word Paying Extra Dividends

By HERBERT J. WEBER

Serendipity is a word coined by Walpole in an allusion to a tale, "The Three Princes of Serendip". In their travels they discovered, by chance or sagacity, things they were not looking for in the first place.

Hence "serendipity" has come to mean the knack or accident of finding valuable things not sought for. It implies a bonus.

We have many cases of it in the foundry.

In one plant, castings were frequently broken on the shakeout machine. Rubber bumpers were installed on the shakeout grate to prevent damage, and the remedy worked. But, to the astonishment of management, the shakeout noise was greatly reduced. That's serendipity!

In another foundry, castings on the various molding floors were shaken out manually at night. It was a very dusty operation even though the flasks were wet with water prior to shakeout. Later the sand was worked with a sand cutter.

"Wet Water" for Temper

One night it was decided to use "wet" water (water containing a wetting agent) in order to control the dust. The atmospheric concentration of dust was reduced by 80 per cent.

The next morning, to their surprise, the molders were most enthusiastic about the "feel" of the sand. One even stated that it was time to get rid of the shakeout crew. The wet water caused uniform temper—a bonus not anticipated. That's serendipity!

I know of a foundry where the constant jolting of flasks on the molding machine caused wear on the pattern plate resulting in a 1/16-in. parting line space when the cope and drag were joined. This not only caused a fin but the casting was out of dimension.

A 1/16-in. thick strip of synthetic rubber was installed on the worn edge of the plate. The rubber eliminated further wear and kept the mold true to pattern. But, unexpectedly, the noise from the machine was greatly reduced. That's serendipity!

In a new non-ferrous foundry, the machine shop was located next to the cleaning room, and there was no dividing wall. Since castings had to be machined to very close tolerances, the cleaning room dust—scarcely visible—was ruining cutting edges of tools. This aggravated the problem of holding tolerances. The dust factor was not recognized at the time.

Problem Vanishes

Soon many of the men in the cleaning room began showing signs of excessive lead absorption. In order to prevent cases of lead poisoning, it became necessary to ventilate the room and isolate it with partition walls.

This worked, and guess what? The machine-shop problem vanished. That's serendipity!

I once used serendipity in reverse. In a certain foundry where tall molds were being poured, I noticed that the men improvised a scaffold from oil drums and crates. When I saw a man teetering on top of this makeshift platform pouring a ton of metal, I was afraid he'd be burnt to death.

Now it happened that this foundry was having trouble with cold shots (shot iron). I told the boss that I knew why. The pourer, while trying to balance on the pile of crates, would frequently take two or three passes at the sprue before he was on target—a sure cause of shot iron. I got my safety scaffold in two days.

The lesson here is clear. The more a safety man or industrial hygienist knows about this casting business, the more chance he has of getting his recommendations through.

Of course there's another way to prevent cold shots—make the men pour barefooted! They'll hit the pouring basin target every time.

But that's cruelty . . . . not serendipity!

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Canadian Foundry Supplies & Equipment Ltd., Montreal 30, Quebec (Main Office)
Canadian Foundry Supplies & Equipment Ltd., Toronto 14, Ontario
Combined Supply & Equipment Company, Buffalo, New York
Foundries Materials Company, Coldwater, Michigan
Foundries Materials Company, Detroit, Michigan
Foundry Service Company, Birmingham, Alabama
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Pennsylvania Foundry Supply & Sand Co., Philadelphia, Pennsylvania
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Circle No. 151, Pages 137-138

The Shovel—Lesson for the Indispensable Man

By H. F. Dietrich

"Get the shovel out of the molder's hands!"

The first time I heard my boss make this statement, I thought he had finally flipped. For generations, the shovel and hand rammer had been the badge of a molder. It was his most versatile tool. It had even become a symbol to embellish his coat-of-arms. To eliminate the shovel seemed as impractical as getting rid of the trowel and slick. As things developed, all of these tools have become relics of the past.

For those of you who have grown up in this modern age of sand hoppers, dribble belts, resin-bond sands, and blow-squeeze molding, the shovel was the ancient molder's universal tool. He used the handle to peen the mold, and the blade to slap it down instead of butt-ramming. It was used to open a frozen sandpile in the morning, and to smooth the surface of the sand heap at night to keep it from drying out. You can see a picture of one of these medieval implements if you will closely examine the AFS trademark.

The original inventor of the shovel, long forgotten in the dim pages of time, did something that is generally considered impossible. This tree-swinging genius invented a tool that couldn't be improved in design. From pre-historic times, the shovel has changed only in the materials used in its manufacture. The shape has changed very little since the first handle was fastened to a flat slab of wood. In its various forms, the shovel serves man in more industries than any other single tool.

From the cradle to the grave, man is dependent to some degree on the flat blade and handle to help him on his way. It helps to grow his pablum, to lay the foundation for his livelihood, and to excavate that final haven of true security. Should he inadvertently flunk physics twice—in this jet age, heaven forbid—or fail to understand Calculus III, he can always rely on the shovel to provide some means of living.

To most men, the shovel is an instrument of torture. It is considered on the same level with the Spanish thumb-screws, the rack, and the iron boot. From their first introduction to the shovel handle, men remember the blisters and the sore back that is part of that initial experience. But the molder developed the use of this universal tool into a fine art.

Once having worn a shovel to fit his use, the molder would protect it from abuse at all costs. It was never allowed to remain in damp sand over night because he knew that a blade once rusted would never scour clean. An overheated blade would cause sand to stick, and a mushroomed edge would dribble sand down the back of his neck when peening a mold. So, the shovel was carefully cleaned after use, and ground to a fine edge when it began to roll up.

By careful manipulation, the shovel was used as a hatchet to contour flask bars, as a mallet to set a sprue pin, and as a catapult to throw sand into a riddle high above the molding floor when working on a ten ring floor mold. It was used as a protective device to prevent the heat of a poured mold from burning the ladleman's hands, as a heat shield on the charging floor, and as a fire extinguisher to shovel sand on a burning wooden flask. On occasion, the shovel has been used to emphasize a point when settling an argument between co-workers.

If ever there was an indispensable tool it must be the shovel. Yet, in traveling through our modern foundries, shovels are hard to find. They have been replaced by the bottom-gated hopper and the dribble belt. We have finally taken the shovel out of the molder's hands. With it have gone the trowel, slick, and swab. In fact, we have eliminated the molder—at least in the form in which he once roamed the earth.

Let the example of the shovel be a lesson to the self-styled indispensable man. He too can be replaced in this electronic age by the electric eye, the punched card, and the magnetic tape.

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Industry Leaders Predict Business Upturn Ahead

First MODERN CASTINGS *Trend Panel report reveals bellwether companies are all set for big sales and product drive last half of 1961.*

Most leaders have overhauled their internal operations in recent months—streamlining communications, organizational responsibilities, and cost controls.

Look for 10-point push in remaining months. All phases of metalcasting will be affected. Those who get there "fustest" will fare best.

You can expect an upturn in the metalcasting industry in the last six months of 1961, if current business indicators are correct. Sales should be good for many companies, fair for the majority. The bellwether companies could benefit most because of aggressive preparations and foresight. Suppliers to the industry, particularly those who are diversified, are the most optimistic.

Such is the consensus of the MODERN CASTINGS Trends Panel. Composed of selected key executives in the industry, casting producers and product suppliers, the panel reflects judgments of the industry's leaders.

All phases of metalcasting are represented by those reporting. Here's the composite on business outlook for the next six or seven months:

63 percent expect sales to be *good to excellent* for *their* companies. The remainder say *fair*.

38 percent estimate that sales will be good for the metalcasting industry *as a whole*. But here there's a division of opinion. 57 percent of the suppliers say *good*, as compared to 29 percent for metalcasters.

Metalcasting industry suppliers are most optimistic about national economy in the months just ahead; 58 percent believe it will be *good*, with 35 percent of the metalcasters of like mind. Again, most of the remainder in both categories believe that business will be better than in 1960 for the nation as a whole. A majority look for the metalcasting industry to follow the nation's upturn rather than to spark it.

What does this thinking mean? Companies best prepared *now* to capitalize on favorable business conditions will fare best in the months immediately ahead. Marketing alertness, coupled with improved products now ready for sale and realistic pricing policies, will pay off quickly.

The positive attitude displayed by many MC Trends Panel members in this confidential report takes on added significance when data on company performance over a recent 9-months period (July 1960 through March 1961) is examined.

57 percent of metalcaster members and 61 percent of supplier members report their companies were behind when compared with the same 9 months period in 1959-60.

22 percent of metalcasters are ahead as compared to 21 percent for suppliers. The remainder report about the same amount of business.

Most companies represented in the panel are ready

← Circle No. 153, Pages 137-138

to move ahead on a broad front as encouraging signs appear. There are three targets which stand out.

1. More sales through profit-making technology.
2. More profits because of management efficiencies.
3. More sales through stepped up sales, advertising and promotion efforts.

Obviously, marketing is receiving more attention than ever before from the bellwether companies represented in the MC Trends Panel.

Metalcaster companies tend to lead in quality control, mechanization, and advertising efforts. Two interpretations can be applied here. One is that many supplier companies already have aggressive programs. Another is that metalcaster companies are reacting to increased demands from customers for better and cheaper products, *and the apparent need to market products more vigorously.* (But keep in mind that the panel just reflects the thinking of selected bellwether leaders of the industry. They are the ones most apt to be aggressive.) The score:

More Quality Control

91 percent of metalcasting companies
70 percent of supplier companies
86 percent of all MC panel companies

More Mechanization

77 percent of metalcasting companies
66 percent of supplier companies
74 percent of all MC Trends Panel companies

More Advertising Effort

40 percent of metalcasting companies
38 percent of supplier companies.

Significantly, more than 89 percent of both groups reporting in the panel say they will put forth *more sales effort* in the next six months as compared to 1960!

This points to better marketing—closer linkage of product development, quality control, better production equipment, and management efficiencies to vigorous advertising and sales efforts. It also indicates that the metalcasting industry is moving closer—at least bellwether companies—to modern marketing methods.

Much supporting data can be found in the panel reports:

70 percent say their companies will do *more product research* in 1961 as compared to 1960.

82 percent of reporting supplier companies will do more.

65 percent of reporting metalcaster companies will do more.

Although product development will spark a strong competitive drive for business, at least among bellwether metalcasters and suppliers, the great need for more attention to marketing is also recognized. Reporting members put as much emphasis on this phase as on profit-making technology.

Activities designed to produce efficiencies through better management and personnel upgrading are also being pushed by panel-member companies. Of those reporting:

52 percent will put more emphasis on safety in 1961; 54 percent for metalcasters, 47 percent for suppliers.

45 percent will step-up employee training, 42 percent for metalcasters, 51 percent for suppliers.

37 percent will give more attention to air pollution and health protection measures; 34 percent for metalcasters, 45 percent for suppliers.

Although these figures are not as impressive as plans for product improvement and more sales, they indicate that leading companies in the industry are seeking to advance on a broad front. These particular figures also point up that the intensive industry improvement programs (such as those of the American Foundrymen's Society) are having a cumulative effect.

Technology-for-profit is in the spotlight today as never before. The demands by users for better and cheaper products are increasing. Business conditions the last 10 months have served to dramatize and accentuate the need.

Strong measures to improve individual competitive positions in the months immediately ahead are indicated by the panel members. Both replacement of obsolete equipment and expansion of productive capacity are part of these plans.

Replacing Obsolete Equipment

54 percent of the bellwether companies reporting expect to replace obsolete equipment during the last half of 1961.

49 percent of suppliers have replacement plans.

Expanding Productive Capacity

31 percent of bellwether companies reporting will expand during last half of 1961.

26 percent of metalcasters.

42 percent of suppliers.

Research facilities are good indicators of competitive ability and flexibility. It is in the laboratory and the plant that new and better products and processes are born. Panel members reporting reveal:

97 percent of suppliers already have research facilities.

68 percent of metalcasters have research facilities.

78 percent of the composite group have research facilities.

Significantly, in 1960 metalcasters led suppliers in companies which have added research facilities to their operations—13 percent as compared to 11 percent. Research facilities added within the last five years are 34 percent and 32 percent, respectively.

What does this mean? Mostly that an increasing number of metalcasters are beginning to recognize the importance of technological development as a

way of getting more business. Most suppliers recognized this fact many years ago. (Again, it should be pointed out that AFS has had a broad technological improvement program on behalf of the industry for many years. And only in the last three years has all the new technology been made universally available to the metalcasting industry, in detail, through the pages of MODERN CASTINGS magazine.

The increased technological activity on a broad scale points to one result: an industry better equipped to battle against competition from plastics, weldments, forgings and similar fabricators. It is in these areas where metalcasters have lost much ground in recent years.

What are the bellwether members of the panel doing internally to be more competitive? Indications are that a broad attack is being made in key areas: management, sales, plant operations and technology. Conventional strategy and tactics are being applied in most instances. But outstanding is the emphasis on sales and product development and innovation. *There is a growing recognition that more executives of all types are becoming involved in the specification and purchase of supplies and capital equipment. It is getting more difficult to find out who makes the key decisions, since more companies are realigning titles and job responsibilities, and reorganizing company functions. Not all of these people are being reached by customary sales techniques and methods.*

This is reflected in the current activities of both metalcaster and supplier members of the MODERN CASTINGS Trend Panel. Striking parallels were noted, both in emphasis and techniques.

Management. Most bellwether companies have been using the last eleven months to overhaul their internal administrative operations. Coordination and improvement seem to have been given first priority. Next come economies and closer control of costs—a natural reaction at this time.

There has been surprising emphasis on training and upgrading. In many cases, advancement programs have been introduced on both executive and worker levels. Most personnel turnover (infrequently mentioned by panel members) has resulted from a desire to obtain more qualified people.

Sales operations are getting special attention from top management, particularly among suppliers. Market determination, sales forecasting, and improved sales planning are being examined carefully by many top executives.

Several companies have sought outside help from various types of consultants. Some companies have put more attention on product diversification, others on trimming inventories.

Self-analysis has most definitely been a key activity on the management level. The result for most companies reporting is that they are now in a better competitive position than they were a year ago.

Sales. This has been a hot spot, as it always is when times get hard. Tremendous pressures have been applied. If reports from the MC Trends Panel are any criterion, every possible sales technique has

HOW METALCASTERS WILL COMPETE TODAY

Here's a 10-point checklist which reveals what leading metalcasters will do to make more sales during 1961:

1. **More Quality Control.**
2. **More Mechanization.**
3. **More Safety Programs.**
4. **More Product Research.**
5. **More Executive Training.**
6. **More Employee Training.**
7. **More Air Pollution Control.**
8. **More Research Facilities.**
9. **More Sales Planning.**
10. **More Advertising and Promotion.**

Significantly, sales effort, equality control, mechanization, and product research will get top billing.

been applied. The net result is that one out of five companies represented is ahead of where it was a year ago. *But the majority have not fared as well. As mentioned before, 61 percent of the supplier companies are behind as compared to 57 percent for metalcaster companies.* This points up that improved sales effectiveness can do part of the job but that economic conditions are the governing factor—even among bellwether companies. The one consolation for these leading concerns, as one panel member points out, is that many companies would have been further behind if greatly increased sales pressures and techniques had not been applied.

Two summary facts stand out in this part of the panel report:

1. The greatly increased number of sales calls, with greater emphasis on the quality and depth of each call.
2. The *addition* of sales personnel by many bellwether companies—a situation which needs careful analysis.

Sales meetings of all kinds have been held, with most companies giving attention to accounts and products which have offered the best sales and profit-making potentials. Greater thought has been given to more accurate sales forecasting. Some companies have expanded territories in an effort to develop new markets.

Plant Operations. If any one phase of metalcasting has undergone a drastic overhauling in the last 10 or 11 months, it has been plant operations.

Leading in all tabulations of bellwether companies reporting has been the drive to get better and more productive equipment. A significant number of companies are expanding their plant capacity. At the same time, there is a drive to reduce manpower. Some plants are automating. Most are seeking better but cheaper products through improved use of manpower as well as modern equipment.

Strong emphasis is being placed on operating efficiencies of all types. Mechanization is apparently the keystone to profitable plant operation today.

Technological. Progress in this area has been recorded and interpreted monthly in MODERN CASTINGS *—usually first and exclusively.* Leading companies are obviously stepping up product research and development. There's no alternative! Efforts vary according to the type of company. Most outstanding, among MC Trends Panel members, are the scope and variety of such programs.

1. New products are emphasized most.
2. Quality control and weight factors are getting much attention.
3. An *aggressive alertness* to sales as well as to product opportunities is being demonstrated.

This eagerness to improve the salability and profitability of metalcasting products is indicated by panel member comments:

. . . "We're spending a greater percentage of our sales dollar on research and development of both foundry skills and products."

. . . "Numerous areas are being probed to change experimental technology to proved production practice."

. . . "Our greatest improvements will come in the technological field. I believe foundry survival depends on good quality merchandise and service. Hence, quality control demands the establishment of a technological laboratory in any foundry that expects to stay healthy."

. . . "We're taking advantage of recent advances in metals properties to increase the speed of equipment."

. . . "We have a continual program of mechanization and standardization progressing towards all possible automation."

. . . "We are listening to all salesmen and trying anything that looks good."

In other words, leading companies in metalcasting today are developing a strong competitive attitude which is reflecting the needs and demands of the times: *Better and cheaper products which can produce a profit.* As one panel member says:

"From our experience, all foundries must learn that they cannot make a profit, let alone an adequate profit, unless they plan it. Foundries do not know their costs. To offer quotes and accept business at prices which can only generate losses is wrong. The problem starts with management but it includes marketing approach and technology."

Another member points out:

"More aggressive marketing methods, policies and procedures are a key to improved conditions. Very often technological improvements fail to be *sold.*"

1961 METALCASTING TRENDS PANEL

Presented here is the first report of the Modern Castings Trends Panel. This panel has four objectives:

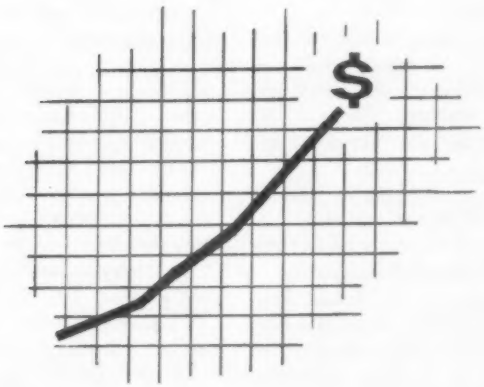
1. To speed the flow of important trend information to the entire metalcasting industry.
2. To present the objective views of key leaders in metalcasting—those who contribute consistently to its advancement.
3. To provide dynamic leadership through the pages of MODERN CASTINGS.
4. To help the metalcasting industry compete more effectively in the market place.

The panel members are carefully selected. Each represents a significant bellwether company in the industry, either producer or supplier. The panel itself is carefully balanced to be representative of the entire industry.

A Five-point Blueprint for Marketing Success

How metalcasters can compete effectively today. A combination of technical and marketing know-how is a basic requirement. Metalcasters, themselves, must take and maintain the initiative.

A staff analysis and interpretation based on MODERN CASTINGS *exploration of markets and market opportunities in the last 12 months.*



AS NEVER BEFORE, metalcasters are having market opportunities dangled before their eyes. —But they must *be able* to take advantage of them. Topflight technical skills combined with shrewd marketing know-how are now basic requirements for those seeking profit and business success today.

This is what MODERN CASTINGS has discovered during these last 12 months in its exploration of metalcasting markets and market opportunities. Five principles must be applied by those who wish to compete effectively.

1. **NEW technology.** This is the key. Far-reaching changes are taking place swiftly. There's a strong trend to cheaper and better products and processes—all produced by fewer but more-skilled workers.

2. **Customer diversification.** A *must!* This means selling to more than *one type* of customer. It's the best way to combat feast or famine business conditions.

3. **Creative sales engineering.** Through sheer ability to help design products, salesmen must be able to take business away from competing industries. Order taking is out! You'll find this attitude in companies who are looking to the future.

4. **Adequate capital.** Two alternatives exist. Metalcasters must either enlarge their businesses or seek to dominate in a highly specialized field. Mechanization is already the password. Automation is just ahead. To compete effectively will take money for equipment and skilled people.

5. **Marketing knowledge and alertness.** It's not enough to know customers. To wine and dine them. You must know *WHERE* they are going! This means studying their problems and their industries. This means knowing their goals, and most important, *where you fit in.*

Some 70 or 80 end-use industries (those to whom metalcasters sell their products) dictate the growth

of the metalcasting industry today. And there are but two ways that metalcasters can insure this growth.

First, by technological advances which produce products cheaper and better than competing industries.

Second, by a thorough knowledge of markets and marketing.

But metalcasters themselves must lead the way.

22 Ways to More Profit

There are many devices and policies which can lead to the creation and sale of more castings. The following were uncovered most frequently during these last 12 months.

Design

1. Alerting designers, engineers, and castings buyers to performance values and cost savings through castings.
2. Training sales engineers to create sales by applying design techniques that convert other fabrication to castings.
3. Redesigning existing products so they can be cast better and cheaper than welding, forging or stamping.
4. Designing castings to a minimum weight.
5. Applying stress analysis techniques to achieve maximum strength only where needed in each casting design.

Plant Operations

1. Hiring more technically trained people for key positions in the plant.
2. Providing training for all workers, such as sending them to AFS Training and Research Institute courses. (A big jump in training enrollments has taken place in the last 12 months.)
3. Stepping up research and development programs. (See report of MC Trends Panel beginning on page 45.)
4. Increasing quality control efforts in all phases of plant operation.
5. Using new molding materials and techniques to improve dimensional accuracy and surface finish.
6. Casting closer to size to minimize machining and to obtain closer tolerances.
7. Introducing mechanization and automation into as many operations as possible.
8. Seeking to build cheaper but stronger patterns.
9. Installing the proper heat treating equipment so that castings will have the correct physical properties.

Management Policies

1. Speeding up time lags between orders and delivery dates.
2. Meeting promised delivery dates.
3. Meeting the competition of stampings, forgings, and weldings with better pricing tactics.
4. Helping customers design and redesign castings.
5. Maintaining better liaison between the customer and the foundry.
6. Developing foundry supervisory personnel to be more alert to the fact that castings must not only be made better but also sold at a profit.
7. Seeking to produce and deliver a complete product to customers—snagged, cleaned, repaired, machined, and painted where feasible.
8. Learning more about marketing (what it involves) and how marketing principles can be applied.

In its explorations MODERN CASTINGS found a surprising lack of knowledge about the *exclusive* advantages of castings. *There is no other fabricating technique which can*:

. . . Process as great a variety of metals and alloys.

. . . Provide such a complete spectrum of physical properties.

. . . Produce such a broad span of sizes and weights, from the tiny castings weighing a fraction of an ounce to huge castings weighing more than 300 tons.

. . . Permit designers almost unlimited freedom in producing complex internal and external configurations.

. . . Form internal holes and cavities so cheaply.

Compete effectively for orders whether a single component or a million components are concerned.

Importantly, these competitive advantages become greater as the metalcasting industry moves closer to more mechanization and automation. *But individual metalcasters must become more aware of their competition.*

. . . Metals are pitted against each other—aluminum, iron, steel, magnesium, zinc, brass, and bronze.

. . . Metals compete with plastics.

. . . Sand, permanent mold, and die casting are involved in a battle for markets.

. . . Metalcastings are vying with forgings, extrusions, stampings, and rollings.

Importantly, technology is becoming a greater factor in determining HOW and WHERE metalcasters will seek markets. Physical facilities and trained personnel will be two key ingredients in such decisions.

Bringing this in to current perspective, MODERN CASTINGS presents a capsule glance at six industries apt to produce market opportunities for metalcasters in the next six or seven months. (See a listing of the 40 markets most important today to metalcasters. An interpretative report begins on page 52.)

Construction Equipment

Sales here may be better than first expected. New equipment sales have leveled off in the last few years, but 1961 is expected to equal 1960. Look for good performance in the last quarter.

The type of equipment falling into this market includes bulldozers, power cranes and shovels, rollers, concrete mixers, crawler tractors, tractor loaders, street sweepers and similar heavy duty products. The heavy capital investment required for this equipment has encouraged rebuilding and reconditioning. Expect the replacement parts business to grow as more equipment is put into operation.

Valves and Pipe Fittings

Good news here! All new construction in 1961 is expected to run ahead of 1960—about four per cent. All phases of the construction industry should provide markets . . .

residential, commercial, and industrial.

Farm Machinery

This year should be profitable for those metalcasters serving this industry. Improved farm income plus a delayed purchase situation in 1960, with many new tractor and equipment models being introduced, should produce a strong market. Continued consolidation of small farms into fewer but larger ones indicates the long range prospect should be promising.

Automobiles

Despite high inventories on January 1 of this year, consumer demand looks very good for the second half. Compact cars may account for 35 to 40 per cent of 1961 sales. This means less casting weight per car (because of aluminum and higher strength-thinner wall ferrous metals) but car makers are using *more* castings per car.

Long range prospects are encouraging. The trend to suburban living and two-car families continues. Highway improvements are stimulating more long distance driving. There is more commuting by car from suburbs into big-city downtown areas. So cars will wear out faster. This means more replacement part sales and shorter-lived cars.

Pumps and Compressors

Although 1960 was a record year for this industry, 1961 is expected to be even better! Continued improvements in design and production facilities are a reason. *Technology again!* Inventory is no problem in this field. Most equipment is custom built.

Steam Turbines

Steady growth is expected here for the next 10 years. New orders for equipment are expected to level off in the third quarter (bottom out from a dip) and then rise by the end of the year. An important aspect for the long pull is the continuing per capita increase in electric power consumption. A recent presidential order has provided further stimulation. Now government-purchased products destined for overseas use must be bought in this country.

Today's Technology

Here's a list of technological advances which have created markets and marketing opportunities for metalcasters. All of these have been reported in detail in MODERN CASTINGS. Consider where the industry would have been if the following developments had not taken place.

air set binders
aluminum bronze
aluminum engine blocks
betatrons
Cobalt-60
CO_2 process
ceramic shell molds
diaphragm molding
dielectric core baking
ductile iron
electronic sand control
epoxy resin patterns
exothermic risers
furan binders
high integrity steel
high pressure green sand molding
high purity aluminum alloys
mold blowing
olivine sand
pearlitic malleable iron
shell molds and cores
sonic testing
stress analysis
thin-walled magnesium castings
vacuum die casting
vacuum melting
water-cooled cupolas
waterless sand
zircon sand

All of these processes have become a vital part of metalcasting operations in the last 15 years. Even today, newer technology is changing and obsoleting these current advances. Better marketing opportunities is the one big result.

40 Leading Markets for Metalcasters Today

Tonnage and dollars revealed in special analysis of new census data. Also, special breakdowns presented for gray and malleable iron, steel, aluminum-base, and copper-base castings.

Five new industry maps show proportional values of foundry production by geographic distribution. *See pages 54, 55, and 56.*

For the first time, information on captive foundry operation. How many and what kind are revealed, for both ferrous and non-ferrous. Captive pattern shops and die casting plants are included in this data.

WHERE ARE THE BEST AND MOST IMPORTANT MARKETS for metalcastings today? And in what tonnages and dollar value?

Here, for the first time, is a listing of the top 40 industry groups accounting for the majority of casting purchases in the nation. Both weight and dollar value are given for four metal groups—gray and malleable iron, steel, aluminum-base, and copper-base castings.

Almost $2 billion worth of castings are purchased, with the dominant influence coming from the automotive industry—over one-fourth of the casting business. The next four industry groups buying the most castings are construction machinery, valve and pipe fittings, farm machinery and equipment, and pump and compressor builders.

This over-all picture of the industry is revealed by a special MODERN CASTINGS study based on yet unsummarized data obtained from the U. S. Department of Commerce. It's a MODERN CASTINGS leadership first designed to help foundries market their products.

Also MODERN CASTINGS has prepared a special set of maps with states proportioned to show the distribution of metalcasting production throughout the United States.

All this data was obtained from the 1958 Census of Manufacturers.

With few exceptions, metalcastings have no functional value until they become a part of a final manufactured assembly—such as an automobile, tractor, machine tool, etc. Consequently the prosperity of the foundry industry is securely hitched to the over-all rate of industrial activity. Operating rates of individual foundries can vary considerably, depending on the end-product industries represented in their roster of customers.

The enigma of simultaneous prosperity and recession was recently demonstrated in the New England area. Foundries supplying castings to the depressed machine tool industry were operating far below capacity. But foundries selling to the booming textile machinery industry had their shops filled with work. So it's the customer who creates the needs.

Many foundries have succeeded in spreading the risk of highly fluctuating demand for their cast products by diversifying their customers. Diversification

can smooth out the extreme peaks and valleys caused by special business situations.

How many captive foundries operate in the United States? For the first time, this information is obtained from the 1958 Census of Manufactures. The results show 611 captive ferrous foundries, 663 captive non ferrous, and 234 captive die casting plants. Also of interest is the 1129 captive pattern shops operated in conjunction with these casting facilities.

The farm machinery and equipment industry operates 53 captive ferrous foundries, valve and pipe fitting manufacturers have 38 ferrous foundries, and pump and compressor builders own 36.

In the captive non ferrous foundry operation the three biggest groups are: valves and pipe fittings with 78; hardware with 59, and industrial pattern-making with 59.

Captive die casting plants number 45 in the hardware industry, 36 among storage battery producers, and 24 within the motor vehicle and parts business.

The table on this page shows dollar value of castings purchased by the 40 principal industrial users. An additional 47 industry groups have been combined into one figure at the end of the table. Each of these 47 industries purchased less than $5,500,000 worth of castings in 1958. The grand total shows almost $2 billion worth of metalcastings purchased. This is the business that is normally available to jobbing foundries on a competitive basis. It does not include castings produced and consumed in the same plant. Based on incomplete data for this captive production, MODERN CASTINGS estimates the value of this segment of production to be $265,110,784. Also excluded from these figures are the sizeable tonnages of gray iron involved in making ingot molds, cast iron pipe, railroad car wheels, and rolling mill rolls. These four items total 3,885,228 tons in 1958 and are sold directly to the consumer.

It is apparent that the automotive industry is by far the largest single purchaser of castings, accounting for 28 per cent of the total sales market. The overall prosperity of the metalcasting industry can therefore be predicted by watching the new car assembly statistics which are published every week.

GRAY AND MALLEABLE IRON:—More than a billion dollars worth of such castings were bought in 1958.

Again motor vehicles monopolize the casting market, accounting for more than half of all the gray and malleable iron castings purchased in 1958. Since 5,560,000 passenger cars were produced in 1954 as against only 4,260,000 units in 1958, the automotive industry used 350,428 tons less gray and malleable iron. However it is encouraging to note that a greater weight of gray and malleable iron castings were used per car in 1958—926 pounds, than in 1954 when the average was only 834 pounds per car.

The average cost of gray and malleable iron castings purchased by all industry groups works out to be 14.3 cents per pound.

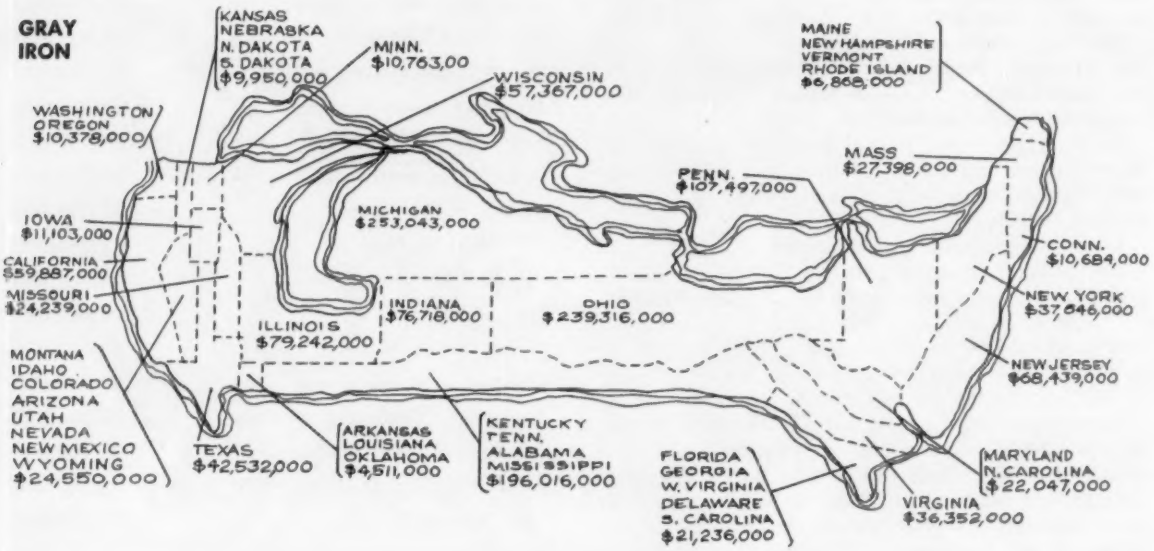
The gray iron industry is centered in the mid-west-

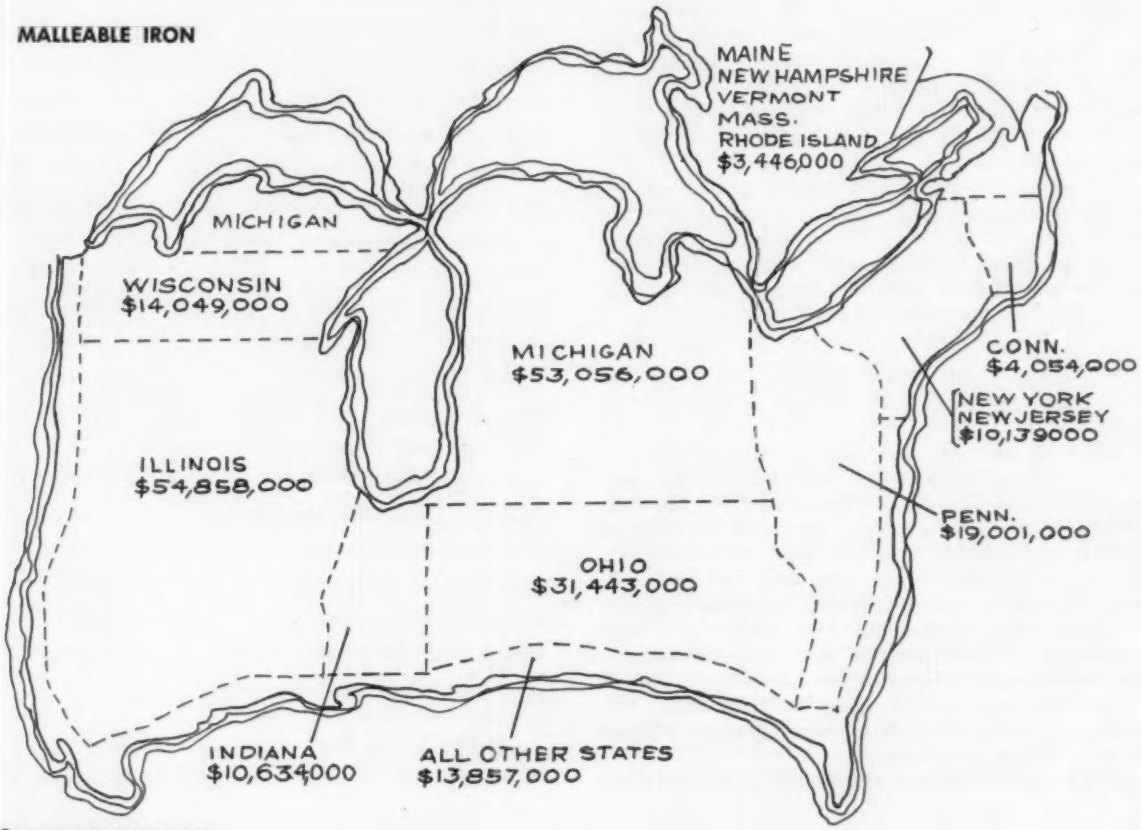
Total Value of All Castings Purchased by 40 Principal Industrial Users in 1958

Industry	Delivered Cost of Castings
Motor Vehicles & Parts	$564,384,000
Construction Machinery	129,055,000
Valve & Pipe Fittings	104,780,000
Farm Machinery & Equip.	97,899,000
Pumps & Compressors	79,825,000
Steam Engines—Turbines	54,006,000
Aircraft Engines & Parts	50,589,000
Railroads & Streetcars	37,967,000
Aircraft Equipment	34,709,000
Motors & Generators	33,639,000
Refrigeration Machines	32,255,000
Power Transmission Equip.	29,727,000
Hardware	27,813,000
Metal Cutting-Machine Tools	27,554,000
Metalworking Machinery	23,846,000
Mechanical Measuring Devices	21,921,000
Special Industrial Machinery	20,739,000
Metal Forming Machine Tools	19,669,000
Locomotives & Parts	19,266,000
Non-electric Heating Equip.	17,967,000
Special Dies & Tools	16,225,000
Household Laundry Equip.	14,418,000
Metal Doors—Sash Trims	13,512,000
Food Products Machinery	13,393,000
Paper Industries Machinery	13,148,000
Printing Trades Machinery	12,367,000
Non-current Carrying Devices	12,292,000
Plumbing Fixtures—Brass Goods	11,248,000
Boiler Shop Products	11,044,000
Shipbuilding—Repairing	10,967,000
Switchgear & Switchboard	10,946,000
Textile Industry Machinery	10,478,000
Metal Stampings	9,744,000
Household Refrigerators	9,371,000
Fabricated Structural Steel	9,270,000
Radio-TV Communication Equip.	9,127,000
Woodworking Machinery	7,205,000
Miscellaneous Metal Work	6,878,000
General Industry Machinery	6,682,000
Ball & Roller Bearings	5,595,000
47 Other Industries Consuming less than $5,500,000 worth of castings in 1958	350,943,000
TOTAL	$1,992,453,000

Distribution of United States Metalcasting Industry by States and Metals

Five special maps for Gray Iron, Malleable Iron, Steel, Aluminum-base, and Copper-base castings begin here and continue on page 55 and 56. Prepared by MODERN CASTINGS, *these maps show comparative size of states by distorting their areas in proportion to dollar value of castings shipped by foundries in each state. Maps are based on data just released in U.S. Census of Manufactures.*





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Value of Ferrous Castings Purchased by 40 Principal Industrial Users in 1958

Gray-Malleable Iron

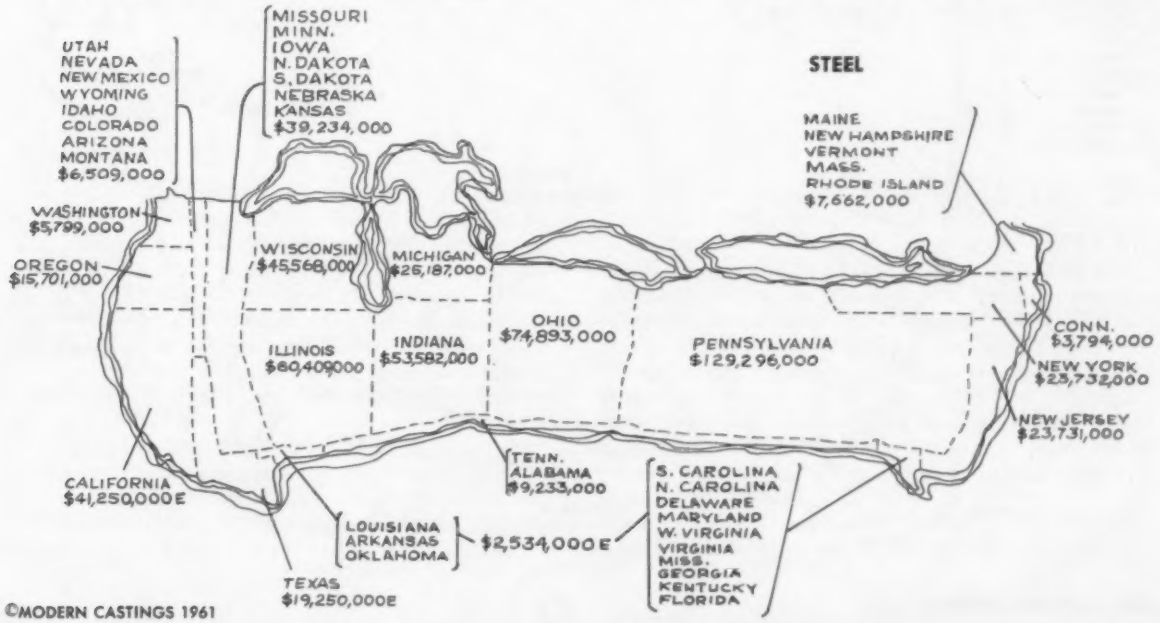
INDUSTRY	Weight of Castings Purchased (tons)	Delivered Cost	Produced and Consumed in Same Plant* (tons)
Motor Vehicles & Parts	1,907,070	$466,939,000	
Farm Machinery & Equipment	292,566	83,270,000	320,136
Plumbing Fixtures	not available	not available	211,467
Internal Combustion Engines	182,712	65,431,000	
Construction Machinery	135,996	44,493,000	3,862
Pumps & Compressors	128,352	46,834,000	56,020
Valves & Pipe Fittings	124,832	40,218,000	
Refrigeration Machinery	98,881	25,158,000	5,477
Metal Cutting Machine Tools	64,015	23,620,000	14,841
Motors & Generators	63,707	21,535,000	
Power Transmission Equipment	63,089	17,936,000	23,575
Machine Shops	45,036	17,939,000	7,628
Non Electric Heating Equipment	43,630	13,680,000	
Hardware	38,859	13,893,000	
Special Dies & Tools	36,642	12,487,000	
Oil Field Machines & Equipment	32,235	7,703,000	4,031
Metal Forming Machine Tools	30,032	9,984,000	10,541
Household Laundry Equipment	28,948	8,854,000	
Printing Trades Machinery	25,656	10,302,000	
Textile Industry Machinery	25,351	9,108,000	2,348
Paper Industries Machinery	24,966	9,900,000	33,491
Special Industry Machinery	24,717	8,230,000	17,135
Industrial Trucks & Tractors	24,060	5,578,000	1,805
Railroad—Streetcars	22,188	10,268,000	
Food Products Machinery	18,354	6,726,000	
Steam Engines & Turbines	17,439	9,381,000	
Boiler Shop Products	17,251	4,654,000	
Noncurrent Carrying Devices	16,719	7,953,000	
Mining Machinery & Equipment	15,781	5,965,000	3,628
Household Refrigerators	14,831	2,974,000	
Locomotives & Parts	14,468	7,905,000	
Conveyors	13,847	5,229,000	
Hand Edge Tools	12,183	5,702,000	
Metal Working Machinery	11,520	4,479,000	
Engine Electric Equipment	11,601	2,999,000	
Woodworking Machinery	11,221	3,492,000	4,187
Measuring—Dispensing Pumps	10,164	2,827,000	
Hoists—Cranes—Monorails	10,108	3,816,000	297
General Industry Machinery	9,525	3,721,000	1,703
Household Appliances	8,781	3,186,000	
All Other Industries	90,197	31,796,000	4,105
TOTAL	3,768,530	$1,079,255,000	726,277

Incomplete because weights of castings produced and consumed in same plant are not available for all companies.

Steel

INDUSTRY	Weight of Castings Purchased (tons)	Delivered Cost	Produced and Consumed in Same Plant* (tons)
Construction Machinery	140,915	$ 77,843,000	3,000
Railroad—Streetcars	76,390	37,064,000	
Motor Vehicles & Parts	62,827	23,349,000	
Valves—Pipe Fittings	40,559	32,893,000	
Steam Engines & Turbines	37,197	39,430,000	
Oil Field Machines & Equipment	22,467	11,803,000	1,273
Farm Machinery & Equipment	21,802	9,163,000	
Aircraft Engines & Parts	21,281	39,499,000	
Locomotives & Parts	17,583	9,802,000	
Metalworking Machinery	17,574	8,918,000	
Aircraft Equipment	17,247	20,222,000	
Fabricated Structural Steel	15,587	5,622,000	
Metal Forming Machine Tools	15,235	8,132,000	
Mining Machinery & Equipment	14,702	10,957,000	
Special Industrial Machinery	14,361	8,224,000	
Machine Shops	13,977	9,078,000	
Hardware	12,150	4,626,000	
Pumps & Compressors	11,605	16,954,000	761
Power Transmission Equipment	11,439	6,865,000	184
Ship Building & Repairing	10,448	6,278,000	3,819
Mechanical Measuring Devices	8,033	5,138,000	
Boiler—Shop Prod.	7,703	4,926,000	
Food Products Machinery	7,668	2,209,000	
Non Electric Heating Equipment	7,634	2,499,000	
Metal Stampings	6,960	2,004,000	
Industrial Trucks—Tractors	5,855	3,422,000	
Refrigerating Machinery	5,754	1,871,000	
Radio-TV Communication Equipment	5,445	2,452,000	
Truck Trailers	5,197	3,039,000	
Hoists—Cranes—Monorails	5,008	3,148,000	350
Motors—Generators	4,916	3,443,000	
Trailer Coaches	4,632	448,000	
Ordnance & Accessories	4,437	3,255,000	
Special Dies & Tools	4,086	2,440,000	
Ball & Roller Bearings	4,022	2,666,000	
Sheet Metal Work	3,829	842,000	
Fabricated Wire Products	3,817	1,493,000	
Industrial Controls	3,650	1,450,000	
Switchgear & Switchboard	3,642	3,502,000	
Lighting Fixtures	3,371	1,886,000	
All Other Industries	41,431	29,349,000	
TOTAL	742,418	$468,204,000	9,387

Incomplete because weights of castings produced and consumed in same plant are not available for all companies.



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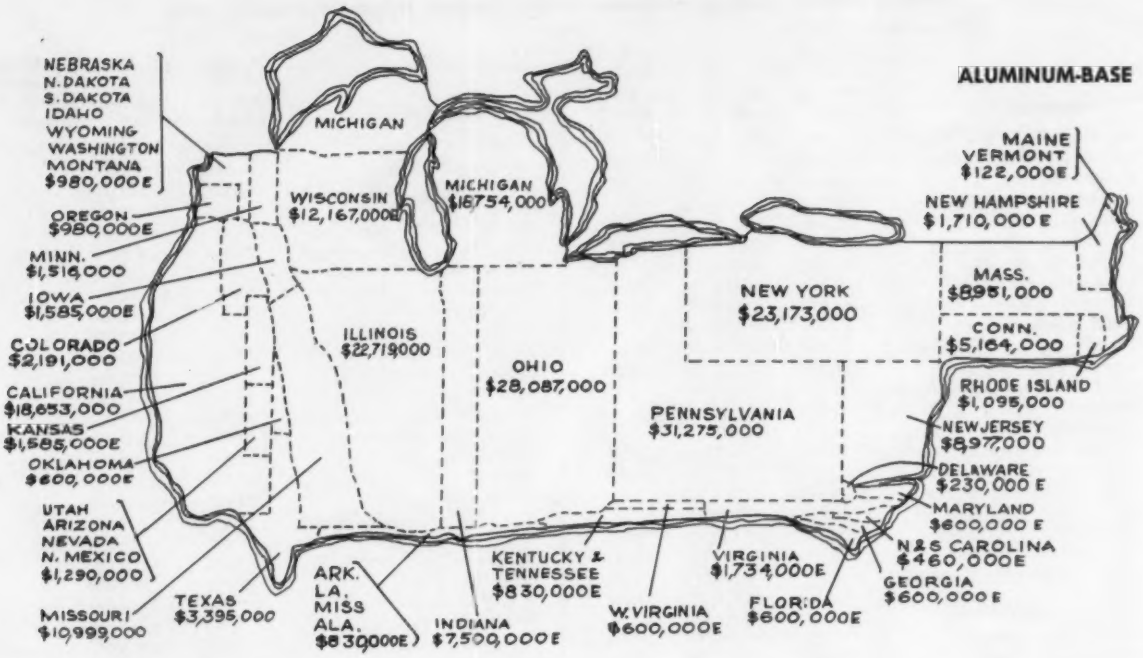

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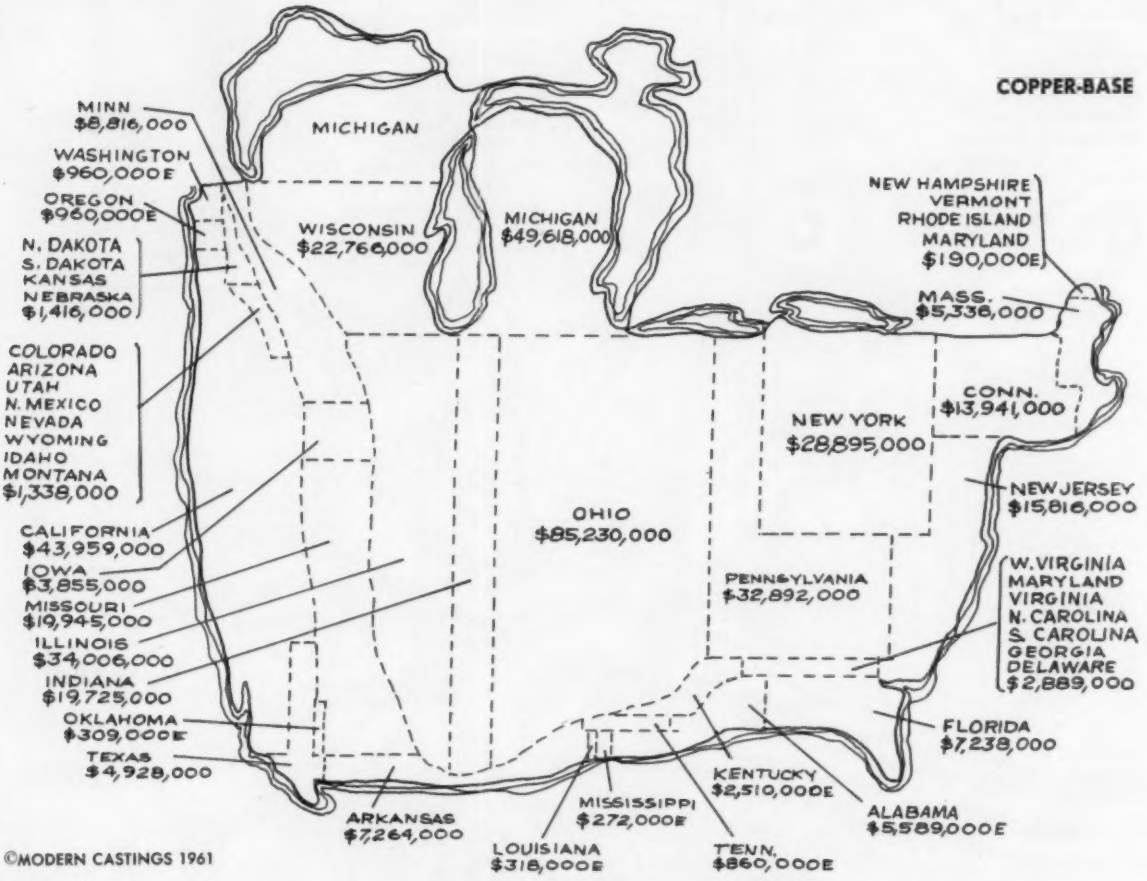

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Value of Non-Ferrous Castings Purchased by 40 Principal Industrial Users in 1958

Aluminum-base

INDUSTRY	Weight of Castings Purchased (pounds)	Delivered Cost	Produced and Consumed in Same Plant* (pounds)
Motor Vehicles & Parts	146,993,000	$ 71,612,000	
Internal Combustion Engines	37,052,000	30,469,000	
Machine Shops	22,885,000	12,887,000	
Metal Doors—Sash—Trim	20,280,000	11,961,000	
Aircraft Equipment	13,008,000	13,791,000	
Motors—Generators	11,225,000	7,681,000	486,000
Mechanical Measuring Devices	10,552,000	8,064,000	
Household Laundry Equipment	10,133,000	5,564,000	
Metal Working Machinery	9,536,000	8,142,000	
Electrical Housewares & Fans	9,105,000	8,228,000	
Aircraft Engines & Parts	8,243,000	10,258,000	
Refrigerating Machinery	7,750,000	3,433,000	
Lighting Fixtures	7,735,000	5,567,000	
Metal Stampings	7,179,000	4,697,000	
Farm Machinery & Equipment	6,705,000	4,274,000	1,044,000
Construction Machinery	5,350,000	3,435,000	
Valves—Pipe Fittings	5,166,000	4,155,000	
Aircraft	5,143,000	9,986,000	
Non Current Carrying Devices	5,137,000	3,567,000	3,082,000
Automatic Temperature Controls	5,120,000	3,440,000	
Hardware	4,869,000	2,788,000	
Woodworking Machinery	4,717,000	1,886,000	
Radio-TV Communication Equip.	4,103,000	4,617,000	
Household Vacuum Cleaners	4,100,000	3,715,000	
Typewriters	3,665,000	2,676,000	
Scientific Instruments	2,920,000	4,729,000	
Food Products Machinery	2,849,000	2,252,000	
Household Cooking Equipment	2,794,000	637,000	
Ordnance & Accessories	2,646,000	2,140,000	
Pumps & Compressors	2,646,000	2,854,000	1,991,000
Hand Edge Tools	2,551,000	1,725,000	
Miscellaneous Metal Work	2,455,000	2,204,000	
Blowers & Fans	2,297,000	1,902,000	
Household Appliances	2,203,000	1,987,000	
Switchboard & Switchgears	2,114,000	1,723,000	
Scales—Balances	2,032,000	1,490,000	
Service Indus. Machinery	2,030,000	1,616,000	
Fabricated Structural Steel	1,936,000	1,795,000	
Industrial Controls	1,808,000	1,116,000	
Office Machines	1,697,000	1,789,000	
All Other Industries	27,507,000	27,303,000	
TOTAL	438,236,000	$301,176,000	6,603,000

Total value of all shipments for all industries in 1958—$422,041,000

**Incomplete because weights of castings produced and consumed in same plant are not available for all companies.*

Copper-base

INDUSTRY	Weight of Castings Purchased (pounds)	Delivered Cost	Produced and Consumed in Same Plant* (pounds)
Valves—Pipe Fittings	56,334,000	$ 27,514,000	61,231,000
Plumbing Fittings—Brass Goods	19,906,000	10,656,000	
Pumps & Compressors	19,550,000	13,183,000	7,968,000
Mechanical Measuring Devices	12,411,000	8,719,000	
Hardware	9,246,000	6,506,000	
Switchgear & Switchboard	8,250,000	5,721,000	
Steam Engines & Turbines	7,397,000	5,195,000	
Shipbuilding & Repairing	5,980,000	4,689,000	2,262,000
Power Transmission Equipment	5,538,000	3,693,000	
Machine Shops	5,254,000	2,844,000	
Construction Machinery	4,368,000	3,284,000	
Motor Vehicles & Parts	4,037,000	2,487,000	
Current Carrying Devices	3,040,000	2,211,000	
Food Products Machinery	2,900,000	2,206,000	
Welding Apparatus	2,779,000	2,204,000	
Metal Working Machinery	2,723,000	2,307,000	
Automatic Temperature Controls	2,535,000	1,582,000	
Internal Combustion Engines	2,516,000	2,085,000	
Radio TV Communication Equip.	2,453,000	2,058,000	
Refrigerating Machinery	2,446,000	1,793,000	
Special Industry Machinery	2,152,000	1,644,000	
Farm Machinery & Equipment	2,003,000	1,192,000	
Metal Forming Machine Tools	1,589,000	1,221,000	
Boiler Shop Prod.	1,574,000	1,270,000	
Metal Cutting Machine Tools	1,558,000	1,278,000	
General Industrial Machinery	1,554,000	1,067,000	
Ball & Roller Bearings	1,445,000	1,267,000	
Mining Machinery & Equipment	1,429,000	827,000	
Oil Field Machines & Equipment	1,377,000	910,000	
Nonelectric Heating Equipment	1,232,000	757,000	
Service Industry Machines	1,218,000	849,000	
Household Appliances	1,204,000	803,000	
Motors—Generators	1,184,000	980,000	311,000
Aircraft Engines & Parts	1,049,000	832,000	
Printing Trades Machinery	1,005,000	762,000	
Non Current Carrying Devices	994,000	789,000	
Paper Industries Machinery	978,000	750,000	
Special Dies & Tools	743,000	583,000	
Aircraft Equipment	718,000	696,000	
Hoists—Cranes—Monorails	716,000	395,000	
All Other Industries	11,481,000	10,356,000	
TOTAL	214,143,000	$139,711,000	71,772,000

Total value of all shipments for all industries in 1958—$220,955,000

**Incomplete because weights of castings produced and consumed in same plant are not available for all companies.*

ern states. With the automotive industry as its biggest customer it is not surprising to have Michigan leading the country in total dollar value of gray iron shipments. The adjacent states of Ohio, Indiana, Illinois, and Wisconsin take advantage of the market also because of the relatively short shipping distances involved. These states are also ideal for gray iron foundry operations because of the large amount of construction machinery and farm equipment manufactured in this area.

Pennsylvania accounts for considerable gray iron tonnage by reason of the rolling mill and roll production facilities concentrated there. Alabama owes its gray iron importance to the fact that it is the largest production center for cast iron pipe. Employment in the gray iron industry has steadily declined from 173,813 in 1947, to 133,914 in 1954, to 112,670 in 1958. However, productivity has risen from $6313 value added per man in 1954 to $7194 per man in 1958.

With more than half of the malleable iron production going into motor vehicles and similar type equipment, production facilities have just naturally prospered in the mid-west. Michigan, Ohio, Illinois, Indiana and Wisconsin account for 76 per cent of our malleable iron production. Practically all the remainder is produced in Pennsylvania, New York, New Jersey, and Connecticut where fittings are a strong market influence.

Employment by malleable foundries has dropped from 29,862 in 1947 to 23,378 in 1954 to 20,230 in

1958. However each worker added $6307 to value of castings shipped in 1958 compared to $5782 in 1954.

STEEL:—No end-use industry particularly dominates this field. Rugged service requirements for parts in construction machinery is reflected in large purchases of steel castings made by this industry. The use of steel castings by aircraft engine and parts manufacturers shows a significant 30 per cent gain when comparing 1954 with 1958. This bears out the influence of higher speeds, temperatures, and stresses which require maximum properties best found in steel. As a further reflection on this trend it is interesting to note that in the same period aluminum casting consumption for aircraft engine and parts has dropped off a drastic 47 per cent! The average price paid for steel casting equalled 31.5 cents per pound. The high price paid by aircraft industry for high integrity steel castings is reflected in the 93 cents per pound paid.

Pennsylvania leads the nation as the center for production of steel castings. This is not surprising since the primary steel industry has for many years been one of Pennsylvania's most important. Similar skills are needed in both industries so the craftsmen and skilled technicians were available for aiding foundry progress.

Once again, the foundry-belt states of Ohio, Michigan, Indiana, Illinois, and Wisconsin account for the big production capacity in steel castings. As in the case of Pennsylvania the influence of the Chicago-Gary steel mill complex is reflected in a location concentration of steel foundries in this area. Around the fringes are sizeable steel casting facilities in New York, New Jersey, Texas, California, and Oregon.

Steel foundry employment has declined from 62,335 in 1947, to 55,073 in 1954, to 49,133 in 1958. Each worker added $7813 to value of casting shipped in 1958 compared with $6497 in 1954.

ALUMINUM:—Again the automotive industry shows up as the big buyer, accounting for about 1/3 of the aluminum casting market. There's been a significant jump in the pounds of cast aluminum used per car. In 1954 aluminum castings averaged 26 pounds per car but by 1948 this had climbed to 35 pounds per car. This trend has continued upward so that in 1961 it exceeds 50 pounds per car. The national average price paid for aluminum castings equalled 68.8 cents per pound. Once more, aircraft castings commanded a higher price namely $1.25 per pound.

Aluminum castings facilities are more widely distributed than the ferrous metals. Although the midwest foundry belt still accounts for most production, we see sizeable operations in Connecticut, New York, New Jersey, Pennsylvania, Missouri, and California. Location of production facilities is of course heavily influenced by such industries as automotive, engine, aerospace, appliances, and electrical. The relatively low capital investment needed to go into the aluminum casting business has encouraged establishment of a large number of small jobbing shops all over the country.

Aluminum foundry employment was 30,045 in 1958 and each worker added $7511 to value of shipments. No comparable data is available for previous years.

COPPER:—Valves and pipe fittings account for the most copper-base alloy casting business. Purchase of Copper-base valves and fittings has registered a considerable gain from 40,610,000 pounds in 1954 to 56,334,000 pounds in 1958. However this gain has been more than offset by a drastic drop from a level of 119,230,000 pounds produced and consumed in own plant in 1954 down to 61,231,000 pounds in 1958. Use of copper base castings in pumps and compressors in 1958 was a million pounds greater than in 1954. Most of the big users represent applications requiring good corrosion resistance, electrical properties, or bearing qualities. The price per pound averages out to 65.4 cents.

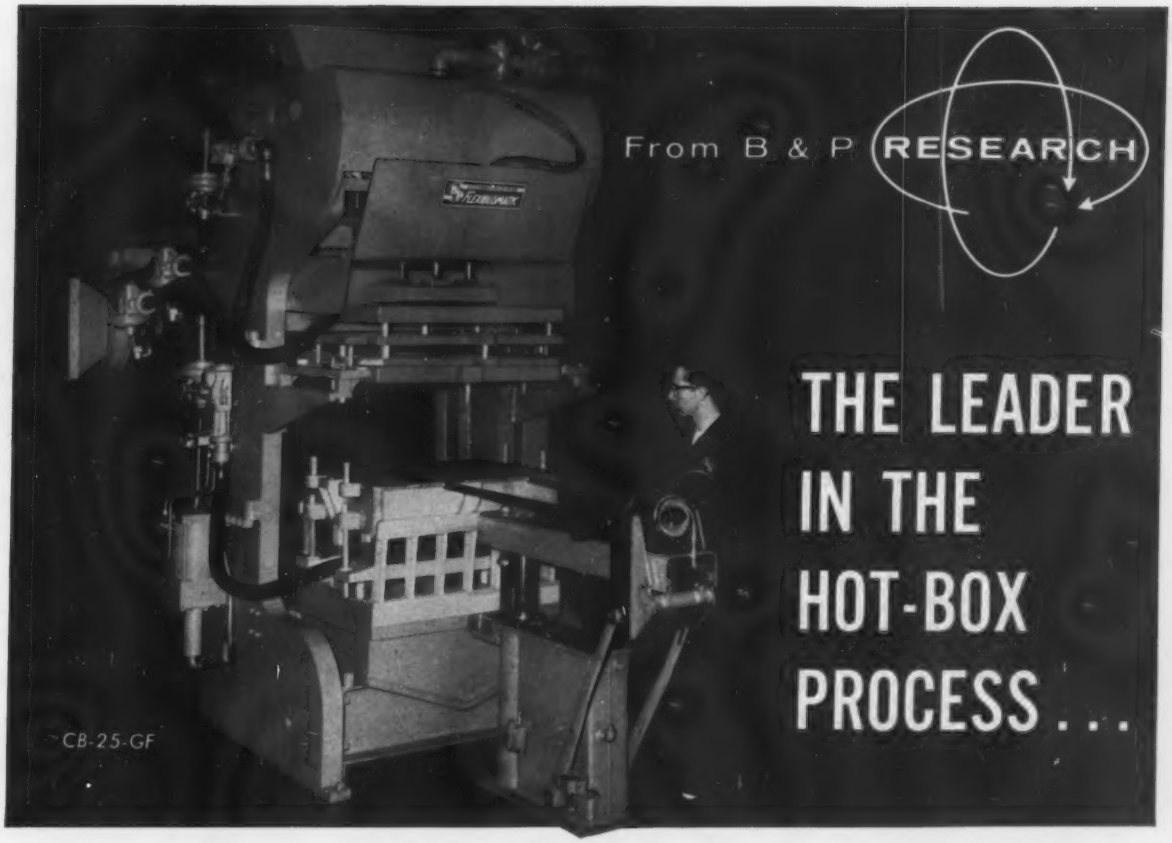
BRASS & BRONZE:—The broad distribution of brass and bronze foundries is almost identical to that of the aluminum industry. Because of universal demand for valves, fittings, plumbing, and hardware the production is distributed in a manner similar to our population. Again, as in the case of aluminum, a large number of small shops are widely scattered from coast to coast.

Brass and bronze foundries employed 14,861 men in 1958 and average per man was $7385 added to value of shipments. No comparable data is available for previous years.

MAGNESIUM:—Data on the purchase of magnesium castings by consuming industries was not gathered in the 1958 Census of Manufactures. As an alternative the foundry production figures are presented. In 1958, magnesium foundries shipped 15,564,000 pounds of sand castings valued at $44,353,000. This is down slightly from the 1954 figures of 16,632,000 pounds valued at $45,153,000. A slight gain has been registered in production of permanent mold and die cast magnesium production. In 1958 castings made by these two processes had shipments valued at $4,577,000 and $4,532,000 respectively. In 1954 the comparable figures were $4,300,000 and $4,520,000.

Weight figures are not available. The upward trend in die casting has continued and it is expected that production by this method will eventually surpass sand casting. Die casting shipments increased 25% in 1960 over 1959 although other types of casting declined. Magnesium casting shipments by states were not tabulated separately so a distribution map could not be constructed.

ZINC:—As in the case of magnesium, zinc casting purchase figures were not collected in the 1958 Census. Shipments by zinc casters reached 239,566,000 pounds valued at $132,897,000 in 1958. The comparable figures for 1954 were 228,834,000 pounds and $112,125,000. Practically all of this production was in form of die castings. About two-thirds of all the zinc die castings are purchased by the automotive industry. So zinc die casting production parallels closely automobile production. A zinc casting production distribution map could not be constructed because state figures were not available.



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*Illustrated is the CB-25-GF, one of 27 Flexiblomatics of this size and model ordered by a major automotive manufacturer.

Only Beardsley & Piper with its vast research and development facilities could bring simplification of design plus top operating efficiency to the newest coremaking process in the industry—The Hot-Box Process. Ideal for all furfuryl-type binders, B&P's Flexiblomatic for the Hot-Box Process produces up to 140 cores per hour using a 15 second cure time. Production will, of course, be increased with reduced cure time . . . and a proportionate increase in cores is achieved through the use of multiple cavity core boxes.

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In addition, the Flexiblomatic assures the best possible core through thermostatic temperature control of both halves of the core box. Automatic sequence control of blow, cure and strip eliminates error, assures uniform cores and minimum time cycles. Production is exceptional with single machine operation but even greater production efficiency can be attained with Flexiblomatic because one man can operate two machines.

Why not call in your B&P representative and get the complete story on the cost-cutting Hot-Box Process. This new process produces cores of outstanding dimensional stability and collapsibility and offers untold savings in time and materials . . . the Flexiblomatic affords optimum savings with the most efficient method of producing Hot-Box cores.

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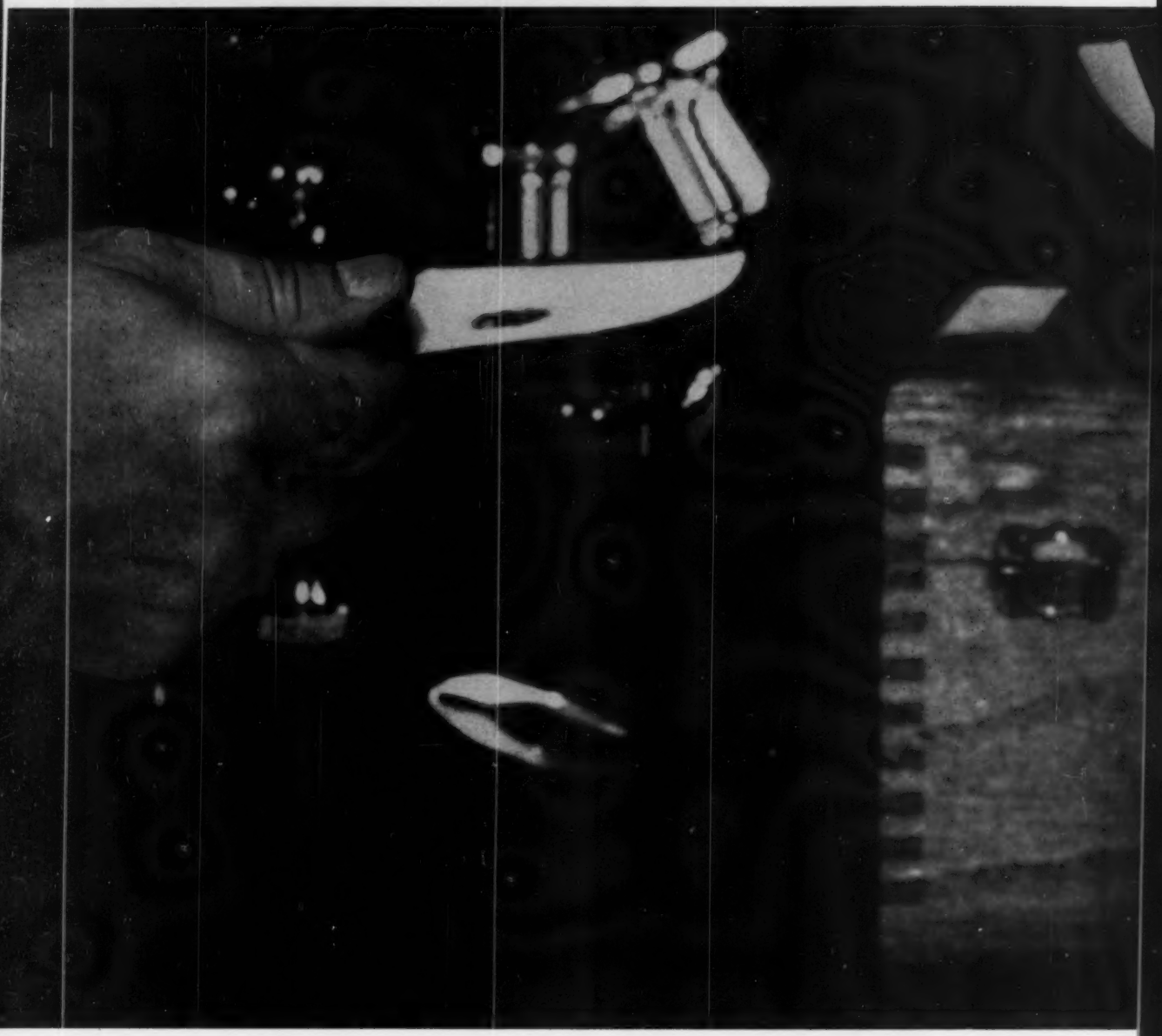

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Circle No. 155, Pages 137-138

65th Annual AFS Castings Congress

Officers and directors who have guided the American Foundrymen's Society are pictured here and on the following page. Use the condensed program to hit the highlights of the five-day session.

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Vice-Pres. Region 7

C. E. Nelson

R. R. Dean, Jr.

D. E. Webster

A. E. Falk

MONDAY, MAY 8

9:30 AM

Brass & Bronze	Concert Room
Light Metals	Cafe
Pattern	Comstock Room

2:00 PM

Brass & Bronze	Concert Room
Heat Transfer	California Room
Pattern	Comstock Room
Sand	Cafe

4:00 PM

Brass & Bronze	Concert Room
Light Metals	California Room
SH&AP	Comstock
Sand	Cafe

8:00 PM

Sand Shop Course	Concert Room
Pattern Shop Course	Comstock Room

TUESDAY, MAY 9

9:30 AM

Brass & Bronze	Concert Room
Light Metals	Rose Room
Malleable	Cafe
Pattern	Room 285

(Continued on page 62)

E. C. Jeter

W. E. Sicha

C. A. Sanders

W. C. Jeffery

W. H. Oliver

W. L. Kammerer

R. E. Mittlestead

T. T. Lloyd

J. T. Moore

R. R. Ashley

N. N. Amrhein

AFS CONGRESS PROGRAM—continued

TUESDAY, MAY 9

Noon

Brass & Bronze	Comstock Room
Pattern	California Room

2:00 PM

Gray Iron	Concert Room
Indust. Engr.	Room 285
Light Metals	Rose Room
Sand	Cafe

4:00 PM

Gray Iron	Concert Room
Light Metals	Rose Room
Malleable Iron	Cafe
Steel	Comstock

8:00 PM

Gray Iron Shop Course	Gold Ballroom
Sand Shop Course	Concert Room

WEDNESDAY, MAY 10

9:30 AM

Annual Business Meeting	Rose Room

10:30 AM

Hoyt Memorial Lecture	Rose Room

Noon

Ductile, Gray & Malleable	Cafe
Light Metals	Comstock Room

2:00 PM

Industrial Engineering	Room 285
Plant & Plant Equip.	California Room
Steel	Gold Ballroom

3:00 PM

Die Casting & Per. Mold	Comstock Room

4:00 PM

Gray Iron	Rose Room
Sand	Cafe
Steel	Gold Ballroom

7:00 PM

Annual Banquet	Garden Court

THURSDAY, MAY 11

9:30 AM

Die Casting & Per. Mold	California Room
Fundamental Papers	Concert Room
Ductile Iron	Room 285
Steel	Rose Room

Noon

Die Casting & Per. Mold	Comstock Room
Steel	Cafe
Past President's Lunch	English Room

2:00 PM

Sand	Gold Ballroom
Symposium on Vacuum Melting & Casting, sponsored by Steel & Fundamental Papers	Concert Room

3:00 PM

Die Casting & Per. Mold	Comstock Room

4:00 PM

Ductile Iron	Cafe

6:00 PM

Alumni Dinner	Georgian Room St. Francis Hotel

8:00 PM

Ductile Iron Shop Course	Cafe
Gray Iron Shop Course	Gold Ballroom

FRIDAY, MAY 12

9:30 AM

Ductile Iron	Cafe
Die Casting & Per. Mold	Comstock Room
Fundamental Papers	Concert Room
Sand	Rose Room
Steel	Gold Ballroom

Noon

Castings Congress Officially Closes

"I'LL TAKE A MILLION TONS..."

Wish he would stop bothering us! Tempting as it is to receive such a big order from the Otherworld's No. 1 Heating Expert — we've got a firm policy to sell only *good* guys.

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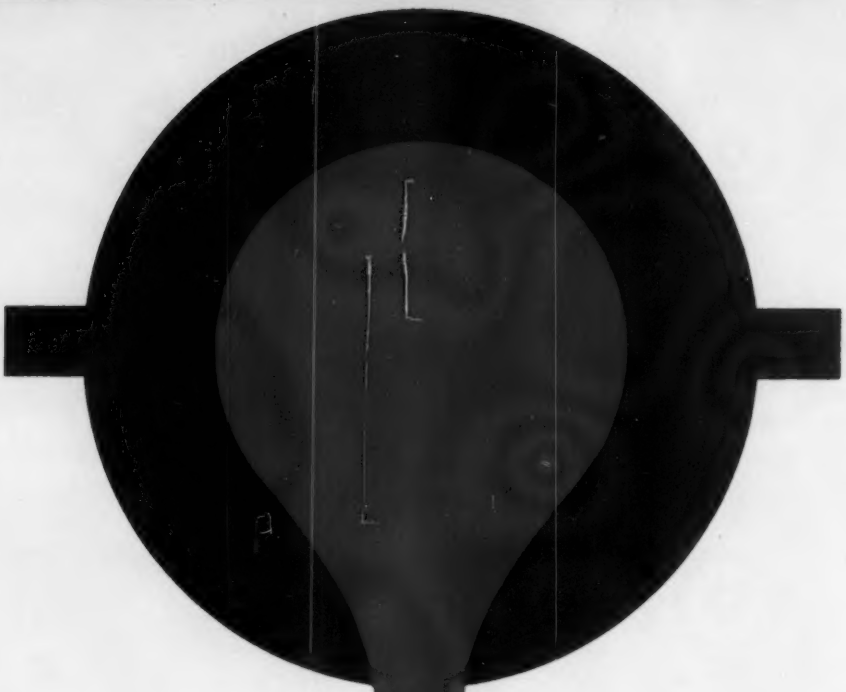
Koppers Premium Foundry Coke



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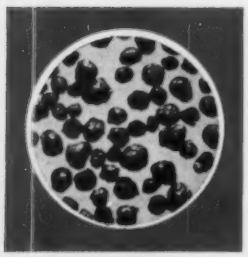

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castings of non-ferrous metals, gray and malleable irons. TERMCO is solid, inert carbon, and not wettable by molten metal. It expands only ⅛ as much as silica sand. As a result, there's no veining, scabbing, penetration or burn-on. Castings just naturally shake out cleaner, smoother, more accurate, precise. And TERMCO replaces zircon, olivine, and other non-silica sands at lower net cost! Requires no special methods or equipment. Why not get all the facts on this revolutionary new molding medium — now! Send today for more detailed information.

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Circle No. 156, Pages 137-138

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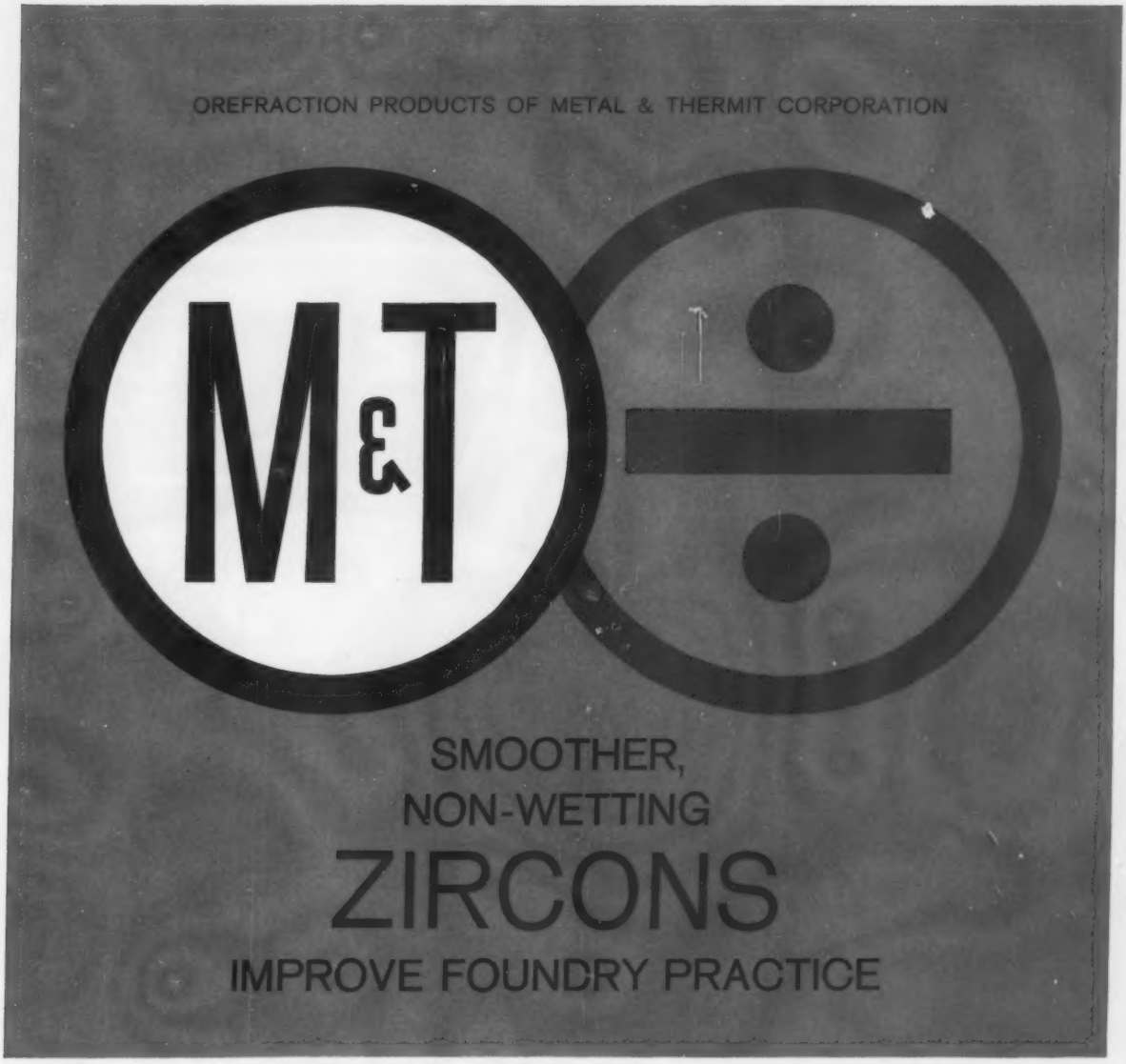

Zircons are unaffected by temperatures which melt silica sand—and are not wetted by molten metal. Finer, rounder zircon grains of much lower thermal expansion provide closer dimensional control and smoother sand-free surfaces. Because zircon sand removes heat four times as fast as silica sand, it offers new foundry techniques for handling deep pockets, thin cores, metal impingement areas and other special problems.

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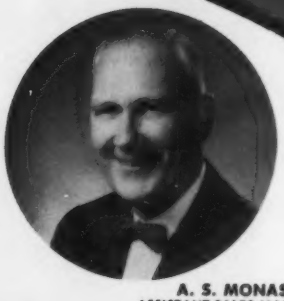

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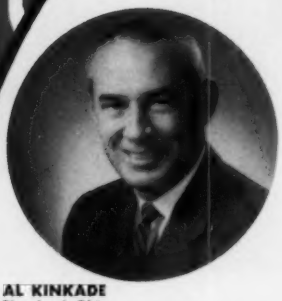

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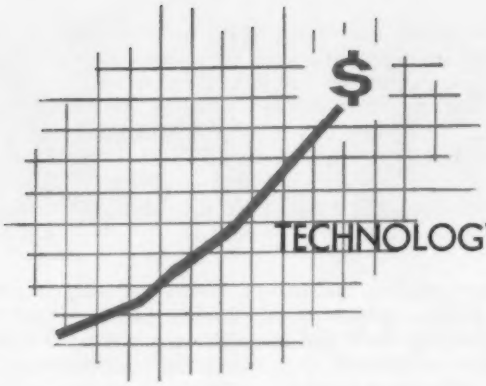

105 Top Technological "Breakthroughs" for 1961

Exclusive interpretive summaries of the year's newest advances in processes and products. More than 180 technical experts and some 600 authorities in metalcasting join to make this report possible as a MODERN CASTINGS *first. These 105 "Breakthroughs" will be presented in detail at the 65th AFS Castings Congress, May 8-12, in San Francisco. For the convenience of the reader, the summaries are listed by metal or division and in order of their presentation.*

ADVANCED PRODUCTION TECHNIQUES, cost-cutting ideas, new markets, and the benefits of hours of scientific research are combined to spell out the very latest in metalcasting progress.

New alloys open new opportunities in missile markets. It has been proven that improved furnace refractories yield economic and metallurgical advantages never before possible. One report reveals that coarse structure can be eliminated in high silicon aluminum alloys by phosphorous treatment, and another shows that casting ductility was doubled by fluidity control.

In steel are revealed new metalcasting technologies leading to large, high strength, high integrity castings. There is a new process using CO_2 gas and special flux-cored electrodes that cut casting repair time in half. A controlled gas atmosphere heat treatment improves aircraft castings fatigue life. One advance is a seven-step program which cuts operating costs and prolongs electric furnace roof life.

Those who are concerned with sand will find that new casting quality standards have been set. They can take advantage of new practices in the CO_2 process which are saving both time and money. They will also learn that molding sand toughness represents a new property for determining suitability of making quality castings, and they will find that the giant Renault Works in France has developed an inexpensive sugar binder for hot box core production.

It is noted that in the iron area, a special German calcium carbide injection technique raises cupola

metal temperature, lowers sulfur content, and increases melting rate.

One important advance is that superior mechanical properties have been achieved in ductile iron by inoculation with calcium-bearing ferrosilicon. Graphite structure is now controlled in malleable iron with tellurium, bismuth and cerium.

A new welding technique permits strong ductile welds of high-strength yellow brass castings. Another important step is an explanation of how induction melting yields substantial cash savings in raw materials. Many new uses have been found for nickel aluminum bronze since welding and fabricating problems have been solved.

Patternmaking advances include a new aluminum alloy for cast patterns. Low melting bismuth allows provide high pattern accuracy and superior finish at small cost . . . another profit extra.

A new system of tilt-pouring in the permanent mold and die casting area eliminates many human errors and promises to result in better castings. At the same time, new mold designs have been yielding maximum quality and production.

These are but a few highlights of the new technology. The following pages list them in summary form. These summaries are aimed at increasing your profit picture.

Light Metals

New market opportunities in the aircraft industry have been created with a new aluminum alloy. The alloy has a marked property advantage over previous aluminum alloys used for cast rings. In addition, the integral test bars more accurately reflect the strength of the matrix of the castings. It appears to solve the problem of the lack of correlation between the tensile strengths of the integrally cast test bars and mechanical properties of coupons excised from the casting matrix.—"A Preliminary Evaluation of M517-T61 as a High Strength Aluminum Alloy Casting Material," W. A. Bailey, E. N. Bossing, F. H. Roebuck, Douglas Aircraft Co. Monday, 9:30 am, Cafe.

Improved communication between the designer, manufacturing engineer, buyer and the foundry are needed to obtain high quality castings for military applications. Foundry surveys by a team composed of a metallurgist, engineer and buyer would aid in evaluating foundries and determining their capabilities to produce and maintain the requisite level of quality in their castings. Such a program gives the bidding foundry the knowledge that it is competing only with other foundries that meet the same standards—rather than losing business to unqualified firms that damage the industry as a whole.—"Meeting the Challenge of High Reliability Castings," W. Babington, Bell Telephone Laboratories, Murray Hill, N. J.; E. E. Miller, Western Electric Co., Greensboro, N. C.; W. R. Clitherrow, Western Electric Co., Monday, 9:30 am, Cafe

New molding technology allows tailoring of sands to achieve optimum metal fluidity. Mold coatings such as carbon black and hexachlorethane can be used to improve mechanical properties of aluminum castings by permitting substantially reduced pouring temperatures. In a 195 alloy test casting, coatings permitted lowering the pouring temperature 100 F., with a doubling in elongation and a simultaneous increase in tensile strength. Additional work also shows the practical effects of molding materials on fluidity. Fluidity is compared in core sand, CO_2 hardened sand, and zircon sand. Also investigated are the effects of such variables as moisture content and mold additives on fluidity.—"Influence of Mold Variables on Fluidity of Aluminum; Doubling Casting Ductility by Fluidity Control," M. C. Flemings, F. R. Mollard, H. F. Taylor, Massachusetts Institute of Technology," Monday, 4:00 pm, California Room.

New aircraft and missile opportunities are open to magnesium sand founders by a new alloy. The alloy has high strength to weight ratios at room and elevated temperatures. At room temperature it possesses 25,000 psi minimum on separately cast test bars and good tensile properties at temperatures up to 600 F. Fatigue and creep characteristics are excellent with good casting characteristics.—"Magnesium-Silver-Didymium-Zirconium Casting Alloy QE22A," D. J. Whitehead, Magnesium Elektron, Ltd. Monday, 4:00 pm, California Room

The presence of 6-14 per cent manganese in aluminum bronze alloys brings about the important benefit of lower sensitivity to melting conditions. No abnormal loss of aluminum or manganese was observed. The pouring temperature of the alloys does not appear to be critical and all retain their properties reasonably well in sections up to 4-in. thick.—"Effect of Chemical Composition on the Structure and Properties of Aluminum Bronzes Containing Manganese, Nickel, and Iron," J. O. Edwards, head, Non-Ferrous Metals Section, Physical Metallurgy Div., Canadian Dept. of Mines & Technical Surveys, and D. A. Whittaker, Ampco Metals, Inc. Monday, 4:00 pm, Concert Room.

Permanent mold foundrymen may be overlooking a new and expanding market which demands lighter and thinner aluminum castings with more strength and reliability. This market not only concerns the airframe industry but other commercial applications

W. A. Bailey

F. L. Arnold

E. N. Bossing

A. C. Burr

V. B. Kurfman

J. S. Prestley

as well. Designers are becoming aware of economics inherent to weight-saving and will put to structural use the higher allowables afforded by engineered castings. The centrifuge will consistantly produce castings with thinner section than is practical by other methods with the highest mechanical properties obtainable in the alloy; dimensional tolerances can be held—casting after casting—to plus or minus 0.010 in six inches; detail can be faithfully reproduced in the casting; and the casting cycle is faster than other methods.—"The Effects of Centrifugal Force on Mechanical Properties of Aluminum Alloy 356 + Be Permanent Mold Castings," A. J. Iler, Northrop Corp., Norair Div. Monday, 4:00 pm, California Room

New fields for foundrymen have been opened through lightweight cellular metal having one-fifth the weight of the base alloy. Both size and shape of the cells can be closely controlled. Applications predicted include filter elements, heat exchanger elements, bearing materials, sandwich core materials, lightweight jig and fixture stock, and anodes for electrochemical processes. Current developments have been concentrated among metals having melting points no higher than aluminum and magnesium but the new technique also applies to those with higher melting points. —"A New Type Light Weight Cellular Metal," L. Polonsky, S. Lipson, metallurgists, and H. Markus, director of the metallurgical laboratory, Frankford Arsenal. Tuesday, 9:30 am, Rose Room

Market opportunities are opening for uranium alloys through new foundry and heat treating techniques. Structural uranium alloys have the best combination of strength and high density of any well-known metal. They can be produced as castings at much lower cost than sintered tungsten alloys and the low level of radioactivity in depleted uranium base alloys is so low that it is seldom a problem in use. Melting and casting techniques are outlined for foundrymen.—"Melting Casting and Heat Treatment Techniques for Structural Uranium Alloys," G. D. Chandley, and D. G. Fleck, Watertown Arsenal. Tuesday, 9:30 am, Rose Room

Production opportunities are now open for aluminum-uranium extrusion billets. The inherent economies of multiple-length castings, permanent molds and high yields of centrifugal casting are realized without sacrificing quality. Sound, non-porous billets, 26 in. long and 5 in. in diameter are produced with a yield after machining of over 75 per cent of the original charge. —"Aluminum-Uranium Alloy Centrifugal Casting," N. E. Daniel, E. L. Foster, and R. F. Dickerson, Battelle Memorial Institute. Tuesday, 9:30 am, Rose Room.

The future of hypereutectic aluminum-silicon alloys has been brightened by an understanding of the technique and the metallurgy of silicon refinement. Research is based on the fact that the alloys can be greatly improved property-wise by a metallurgical modification in the refining of the primary silicon crystals by phosphorus. Practically, the investigation tells the foundryman the form in which the additions can be made, the amount needed and the limitations imposed by melting and by the casting method. Technically, the observation of the nuclei responsible for the refining process should open the way for further metallurgical study. The use of these alloys should be limited only by the industry's ability to exploit their unique combination of hardness, wear resistance, low density and low coefficient of thermal expansion. —"Phosphorus Refinement of Hypereutetic Aluminum —Silicon Casting Alloys," F. L. Arnold, J. S. Prestley, Reynolds Metals Co. Tuesday, 2:00 pm, Rose Room.

Grain size control in the light alloy foundry is taking on aspects of a science with the development of modern theories of nucleation and supercooling. Until recently the theory had been too vague or restricted in application to be of direct use. Results of testing confirm that current theoretical ideas relate very directly to grain size effects. The observed supercooling in poorly nucleated or coarse grain melts is often large enough to be easily measured, and such measurements can be accomplished in the melt room with results used as a fast check on grain refinement processes. It is possible to ascertain that better nuclei,

more nuclei, more solute, or faster cooling will lead to better grain size control.—"Supercooling Measurements and Grain Size Control in Light Alloys," V. B. Kurfman, Metallurgical Fundamental Section, Metallurgical Laboratory, The Dow Metal Products Co. Tuesday, 2:00 pm, Rose Room

On-the-spot results of the hydrogen content in aluminum melts greatly improves quality control by providing the gas level data before pouring. Increasing emphasis on quality calls for the reduction of melt hydrogen content to a level which will minimize or eliminate gas porosity in castings.—"The Initial Bubble Test for the Determination of the Hydrogen Content of Molten Aluminum Alloys," D. J. Neil, and A. C. Burr, Aluminum Laboratories, Ltd. Tuesday, 2:00 pm, Rose Room

Designers of investment castings in magnesium alloys now have several alloys available for their selection. This should broaden the scope of application of this process. In the beginning, magnesium parts were used primarily for weight saving. A large percentage were furnished in "as cast" condition and did not require radiographic or fluorescent penetrant inspection. Today, engineers are designing structural parts, and mechanical properties and soundness are of prime importance. Many combinations of mechanical properties are now available to the designer of investment castings through the proper selection of alloys and heat treatments.—"Investment Cast Properties of Four Magnesium Base Alloys," Kenneth L. Herrick, chief, Engineering Department, Arwood Corp. Tuesday, 4:00 pm, Rose Room

The airframe industry represents an expanding market for high integrity, high strength light metal alloy castings. Higher and higher guaranteed strengths plus weight savings make these castings attractive to designers. Some strength increases have come through alloys, but most improvements can be traced to careful application of basic foundry principles. The foundry industry's potential can not be fully realized until more than a handful of metal-casters are sufficiently optimistic to try.—"Progress in High Strength Aluminum Alloy Castings for Airframes," W. A. Bailey and E. N. Bossing, Douglas Aircraft Co. Tuesday, 4:00 pm, Rose Room

Aircraft quality castings can be produced from magnesium sand castings. Alloys AZ92A, ZK61A-T6, and QE22A-T6, show the most promise with respect to maximum strength castings. All are capable of meeting aircraft and missile requirements. Proper gating, risering and chilling, metal handling, and heat treatment produce premium quality castings with mechanical properties equal to or better than found in separately-cast test bars.—"Premium Quality Magnesium Sand Castings," K. E. Nelson, Wellman Bronze & Aluminum Co. Tuesday, 4:00 pm, Rose Room

Sand

Improvements in the CO_2 process point to cost and time savings in the foundry. It has been shown that by using a more alkaline silicate and making a suitable increase in moisture content, it is possible to use a much wider range of sands than previously considered acceptable. In foundries where much of the production is in green sand, up to half the carbon dioxide process mixture can be the burnt sand discarded from the green sand system, with the remainder being undried silica sand. The residual strength after cooling from high temperature is reduced, and there is less difficulty in core removal. It has been found that if the CO_2 is diluted with air, about in equal parts, the gas waste is lessened and a more uniform mold or core obtained.—"Improvements in the CO_2 Process," Douglas A. Taylor, British Cast Iron Research Association. Monday, 2:00 pm, Cafe

New method of testing high temperature strength of molding and core sands breaks from previous techniques. High temperature tests of sand in the past evaluated solid cylindrical specimens. The new testing method involves a hollow cylinder 2.0 inches long by 1-1/8 inches O.D., which has been hollowed out during ramming to 0.50 inch I.D.; wall thickness of the sand is thus 5/16-inch. The thin wall section more nearly represents a section of the mold immediately adjacent to the metal-sand interface.—"A New Approach to Testing the High Temperature Strength of Molding and Core Sands," Professor R. W. Heine, University of Wisconsin; J. S. Schumacher, vice president, and E. H. King, president, The Hill & Griffith Co. Monday, 2:00 pm, Cafe

Castings of superior quality have been produced using calcined fluid coke as a molding medium. Molds and cores composed of this new form of carbon granual—described as "carbon sand" but differing in grain shape and appearance from previous carbon materials—were used to cast commercial aluminum, bronze and gray iron. Using silica and zircon sands as standards for comparison and supported by laboratory data, it was found that the calcined fluid coke had superior qualities as a molding medium. Uses in green molds, baked cores, shell molds and as a core wash ingredient are examined.—"Preliminary Evaluation of Calcined Fluid Coke As a New Molding Medium," E. G. Gentry and C. L. Lear, Humble Oil & Refining Co. Monday, 2:00 pm, Cafe

Principles of soil mechanics can be applied to determine proper use of squeeze boards in compacting sand molds. Best squeezing results are achieved by leaving at least one-inch clearance between perimeter of board and sides of flask.—"Granular Movement During Squeezing", Douglas C. Williams, Associate professor, Department of Metallurgical Engineering, The Ohio State University. Monday, 4:00 pm, Cafe

Despite new processes and techniques, strict control is the cornerstone for quality castings. Mulling operation variables present one of the major obstacles in sand design and control. Many factors in the cycle itself accentuate and compound the variables. In addition there is a significant difference in the mulling performance of various mullers. It is not possible to produce sands of consistent quality at low water levels when low mulling efficiency is employed.—"Systematic Approach to Sand Design and Control, Progress Report 3—The Mulling Effect," A. H. Zrimsek, foundry engineer, and G. J. Vingas, research engineer, Magnet Cove Barium Corp. Monday, 4:00 pm, Cafe

Almost any combination of physical properties can be obtained through variations in clay and water content and mulling efficiency. The tremendous variation in physical properties possible through mulling alone helps explain why sand formulations which work wonders in one foundry often cause chaos in others.—"Systematic Approach to Sand Design and Control, Progress Report 2, Clay-Bonded Sand Dry Properties," A. H. Zrimsek, foundry engineer, and G. J. Vingas, research engineer, Magnet Cove Barium Corp. Tuesday, 2:00 pm, Cafe

Some old concepts about the effects of mulling on clay distribution were jolted by recent observations at high magnification. The microscope revealed that clay coatings on individual sand grains lack uniformity. Extensive mulling does not seem to improve the uniformity of the clay coating. Apparently, the increased green strength that accompanies mulling is attributable to an increase in the clay itself.—"A Microscopic Study of the Bonding of Steel Foundry Sands by Clays," J. B. Caine, consultant; E. H. King, president, and J. S. Schumacher, vice president, Hill and Griffith Co. Tuesday, 2:00 pm, Cafe

Metalcasting progress is linked with industry-wide sharing of information and ideas. Precision castings are the goal of every foundryman. However, many old timers are not aware of the latest practices and techniques, and many of the newest members have not availed themselves of the knowledge of the older craftsmen. A blending of these knowledges will advance the entire industry.—"Precision in the Foundry," A. Short, manager, Rolls-Royce Foundries. Tuesday, 2:00 pm, Cafe

Molding sand toughness represents a new property for determining sand acceptability. The manner in which molding hand rams to form a molded mass that will possess toughness is of importance in the production of quality castings. Sand possessing a good degree of toughness after ramming will allow for rapid stripping from the pattern, ease of patching, rough handling of the molds, and hard pouring of metal. Sand possessing a toughness in excess of that required by the molding method or size of casting will handicap the molding in that the sand will not ram as easily as it should. An increase of toughness in a sand decreases the moldability, flowability or ease of ramming. The toughness of the sand, as determined by the jolt impact, is closely related to the sand toughness as determined by multiplying compressive strength by green ultimate deformation times 1000.—"Jolt Impact as a Measure of Sand Toughness," T. E. Barlow, foundry sales manager, Eastern Clay Products Dept., International Minerals & Chemical Corp., and H. W. Dietert, chairman of the board, Harry W. Dietert Co. Thursday, 2:00 pm, Rose Room

Foundrymen can improve sand design and control through interpretation of continuing research. An analysis of the interaction of the various physical properties of sand mixtures covers four previous investigations. Data are included to emphasize some of the basic principles and characteristics of sand formulation.—"Systematic Approach to Sand Design and Control, Progress Report 5—Interpretation of Data," A. H. Zrimsek, foundry engineer, and G. J. Vingas, research engineer, Magnet Cove Barium Corp. Friday, 9:30 am, Rose Room

Precision molded castings at lower than conventional costs are being made in France with thermosetting binders and hot core boxes. Varying proportions of

D. J. Neil

C. L. Lear

H. A. Knappenberger

E. G. Gentry

A. Short

sugar and urea formaldehyde are used as binders. After more than three years' use in mass producing automotive parts, the advantages realized include simplification of sand preparation, elimination of dryers, drying plates, and core wires, replacement of large core ovens by small heater units, and accuracy of core assemblies which normally reduces finishing operations.—"Core Production in Hot Boxes at the Renault Works," Philippe Jasson, engineer, Renault Foundry Laboratory. Thursday, 2:00 pm, Gold Room.

The role of wood flour in sand systems is generally oversimplified. It is generally believed that wood flour additions increase green strength, lower dry strength, and improve flowability. The addition of wood flour to a clay-sand-water systems does not in reality lower dry compression strength of western bentonite sands. It simply increases the water content required to obtain a given dry compression level. In a similar manner, green compression strength is not increased perceptibly.—"Systematic Approach to Sand Design and Control, Progress Report 4—Wood Flour," A. H. Zrimsek, foundry engineer, and G. J. Vingas, research engineer, Magnet Cove Barium Corp. Friday, 9:30 am, Rose Room.

Profitable operations are assured with the carbon dioxide process if the fundamentals are understood. Inexperience is the chief cause of difficulties. Some misunderstandings exist concerning the mechanism involved when sodium silicate treated sand hardens when exposed to carbon dioxide. This, and the operating variables, must be understood in order to realize the maximum in properties and reliability.—"A Study of the Carbon Dioxide Process," G. D. Haley, WaiMet Alloys Co., and J. L. Leach, University of Illinois. Friday, 9:30 am, Rose Room

Steel

Kilocurie cobalt source materials permit meeting toughest quality control of heavy sections without high cost x-ray installations. New techniques permit greater output with smaller physical size. In addition, new sources allow heavy section radiographs of 12 in. thick steel sections with better than 2 per cent sensitivity. In some cases better than 1 per cent sensitivity can be achieved in sections greater than 2 in.—"Radiography of Cast Nuclear Components By Means of Kilcurie Cobalt Sources," R. Lent vice-president, general manager, Pacific Southern Foundries, Inc. Tuesday, 4:00 pm, Comstock Room.

Big dividends can be realized from betatron radiographing of heavy sections. It can be used as a major tool to develop gating and risering practices, to check removal of defects in heavy sections, to check quality of weld repairs prior to final processing, and for final radiography in accordance with customer requirements. The unit has very little down time or equipment failure, is safe with normal precautions, has maneuverability, requires less exacting calculations and skill to produce results, and personnel training is comparatively easy.—"Use of the Betatron for Radiographic Examination of Heavy Section Castings," L. J. Venne, Esco Co. Tuesday, 4:00 pm, Comstock Room.

Aerospace applications continue to provide a market for steel founders. However, designers must be resold and emphasis placed on quality and reliability. Since every part is a critical component in complex aerospace systems, castings must be upgraded through the use of more science. The days of large orders for aerospace castings is gone and philosiphies must be revised for the industry to regain its portion of the market.—"High Strength Structural Steel Castings for Aerospace Applications," W. R. Roser, Norair Div., Northrop Corp. Wednesday, 2:00 pm, Gold Ballroom.

Missile casting designers and foundrymen must stop playing "Pin-the-Tail-on-the-Donkey" games. A designer sets up the donkey, and a foundryman holds the tail. But, if the designer creates a reasonable donkey, and the foundryman takes off his blindfold, the game can be won every try. This amounts to a problem of communications. Missile castings function as a part of complex structures involving extremes in environments, loads, and geometrical requirements. Designers visualize castings more as a part of the whole than as a part itself. They do not see the castings as they are, but as they conceive that they will be. Foundrymen, on the other hand, often have insufficient appreciation of the whole structure.—"Design Problems in Missile Castings", R. G. Bassett, Boeing Airplane Co., Aero-Space Div. Wednesday, 2:00 pm, Gold Ballroom

Considerable opportunities exist for foundrymen in the aerospace vehicle field. Tremendous increases in power plant thrusts have highlighted deficiencies in present materials. Improvements in casting techniques will open gates to much wider acceptance of castings at present. Castings offer considerable savings over forgings in the fabrication of new non-ferrous alloys, super steel alloys, and refractories now under investigation.—"Horizon Requirements for Castings," S. R.

Carpenter, design specialist, Convair, Div. General Dynamics Corp. Wednesday, 2:00 pm, Gold Ballroom.

The aircraft and missile industry is depending on metalcasters to alert design engineers in advance about pre-production difficulties. Putting off solving these mutual problems only delays delivery and adds to casting costs. A minor alteration of design configuration can often eliminate both casting and aircraft production roadblocks. Coordinated planning by designers and foundrymen is essential.—"Challenge or Compromise with Aircraft-Missile Steel Castings", S. A. McCarthy, senior product design engineer, McDonnell Aircraft Corp. Wednesday, 2:00 pm, Gold Ballroom

Procurement specifications for ground missile castings must be standardized. It is proposed that the aircraft and missile industry and foundrymen reach an agreement whereby designers of ground missiles use specifications that will assure adequate quality at minimum cost, but also avoid the complexities of aircraft quality. Realistic end-use prospective and steel foundry casting limitations need to be incorporated into the design of the GSE missile casting. Not only should the foundrymen point out the inconsistency of specifying aircraft quality for ground castings, but further he should be prepared to recommend a specification covering metal and quality that will suffice for the application.—"Procurement of GSE Missile Castings," Loren W. Smith, assistant vice president, Symington Wayne Corp. Wednesday, 4:00 pm, Gold Ballroom

Technological breakthroughs have linked the casting and forging processes by press forging high alloy steel castings. Results include high mechanical properties while ductility values are high enough for aircraft parts. Aside from property improvements, conventional forging methods and temperatures may possibly be used for final shaping of precast parts. Such methods will simplify forging of very complex shapes impossible to achieve such as deep and thin flanges.—"Press Forging of High Alloy Steel Castings," P. R. Gouwens, supervisor, foundry and steelmaking research, Armour Research Foundation of Illinois Institute of Technology. Wednesday, 4:00 pm, Gold Ballroom.

As the result of a steady flow of technological breakthroughs, the steel foundry industry is now capable of producing large, high strength, high integrity castings. Castings have good surface quality, high degree of soundness, reduced cracks and hot tears, and a superior reliability factor. Production details for five difficult aircraft castings demonstrate practical application of new metalcasting technologies.—"The Development of Foundry Procedures for High Integrity Castings," R. J. Ely, assistant chief metallurgist, J. E. Fries, process metallurgist, American Brake Shoe Co. Wednesday, 4:00 pm, Gold Ballroom.

Industry-wide quality breakthroughs must be effected for the foundry industry to maintain its market. Major users report rejections of 5 per cent of castings purchased plus additional losses due to machining and handling. This severe indictment of the industry and warrants much concern by top management. Metalcasters must make quality and reliability its major concern and must accept the challenge to change basic attitudes toward product improvement. Quality control can not do the job alone, it must start at the top of industry and filter down.—"Meeting the Challenge of Controlling Quality," Larry Krueger, works manager, Pelton Steel Casting Co. Thursday, 9:30 am, Rose Room

Ferrous foundrymen can increase ladle refractory effectiveness with the use of magnesite in nozzles. Refractories commonly used in ladles have little or no reserve capability to withstand increases in temperature. All other refractories in the ladle are improved by the use of materials containing alumina in amounts considerably higher than ordinarily used. The improved performance offsets the higher initial cost.—"A Test Program for Improving the Performance of Ladle Refractories," P. J. Neff, J. J. Downs, and T. J. Baker, American Steel Foundries. Thursday, 9:30 am, Rose Room.

X-ray sound steel castings by investment foundries are a product of improved gating systems. Data compiled on a round bar fed by an infinite riser shows the relationship to be linear between the length of the sound bar and bar diameter. The feeding range increases with mold temperature, pouring temperature, and carbon content of the steel.—"Feeding Distance of Bars in Investment Molds," H. Present, chief process engineer, Arwood Corp., and H. Rosenthal, metallurgist, Frankford Arsenal. Thursday, 9:30 am, Rose Room

A practical means of minimizing interface reactions may be possible through use of organic sand binders which control the interface atmosphere. In studies, the atmosphere produced by phenolic resin bonded shell molds resulted in slight reaction and reaction products typical of a less oxidizing atmosphere than green sand molds. Manganese additions caused extensive silicate melt formation. The reaction became more pronounced with increasing manganese content in green sand molds.—"Factors Affecting Metal Mold Reactions," G. A. Colligan, United Aircraft Corp., L. H. VanVlack and R. A. Flinn, University of Michigan. Thursday, 9:30 am, Rose Room.

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R. G. Bassett

S. A. McCarthy

H. Present

T. E. Ban

K. E. Pinnow

C. D. Thompson

Steel foundrymen can eliminate their most serious macroinclusion problem. Reaction with ladle refractories can be eliminated through the use of alumina or magnesia refractories or a newly designed whirl gate trapping system. Design features of the latter include an exit-inlet ratio of 1:1.5, rotation of metal through 270 degrees before passing exit, and extension of the cylindrical section below the exit level. "Cast Steel Nonmetallic Macroinclusions Sources and Prevention," R. A. Flinn, professor of metallurgical engineering; L. H. Van Vlack, professor of ceramics and metallurgy; and W. B. Pierce, Dept. of Chemical & Metallurgical Engineering, University of Michigan. Thursday, Noon, Cafe.

Ferrous foundrymen can control surface defects caused by molten iron and steel reactions with ladle refractories. Basic research shows that where this is encountered, it is adviseable to use a higher alumina or magnesia refractory. The cost may be more per unit of refractory, but the cost per unit product can be materially reduced. It is also important to avoid over-specification of refractories. The testing procedures indicated permit a simple evaluation of the correct refractory selection. The most severe reaction between molten metal and refractories occurs in the nozzle and ladle-well or ladle-spout area.—"Evaluation of Refractories as Sources of Macro-Inclusions," L. H. Van Vlack, J. E. Brokloff, R. A. Flinn, University of Michigan. Thursday, Noon, Cafe

Foundrymen can cut operating costs and prolong electric furnace roof life through a seven-step program. These include higher alumina brick in critical areas, replaceable center sections, corrugated arch brick to prevent slippage, drip ring to control directional flow of molten refractory, roof ring design, and giving thought to suggestions from refractory representatives, other sources, and experimental work.—"High Alumina Roofs for Electric Arc Furnaces," R. E. Gray, assistant superintendent, Electric Furnace Dept., Texas Steel Co. Friday, 9:30 am, Gold Ballroom

Steel foundrymen can now share in the aircraft and missile market today by improving casting fatigue life. The key to this is a controlled gas atmosphere heat treatment. The surfaces of steel castings when oxidized in heat treatment and especially when scaled, contain residual tensile stresses due to oxidation and surface irregularities. Steel foundry heat treaters, through the use of controlled gas atmospheres, can aid in producing the needed fatigue life improvements necessary for the aircraft and missile market. —"Improve Fatigue Life of Steel Castings by Controlled Heat Treatment," R. D. Block, Barber-Coleman Co. Friday, 9:30 am, Gold Ballroom.

Steel foundrymen can now cut casting repair time in half. New process involves CO_2 gas and a special electrode with proper fluxes in its core. Weld metal has satisfactory mechanical properties and repair work cuts costs 20 to 60 per cent.—"A Flux-Cored CO_2 Welding Process for Repairing Steel Castings," J. M. McCarthy, Research & Development Dept., National Cylinder Gas, Div. Chemetron Corp. Friday 9:30 am, Gold Ballroom.

Steel foundrymen can quickly and effectively reduce the sulfur content of medium carbon, medium alloy steel. A six-point program will consistently cut sulfur to 0.002-0.003 per cent. Not only does the steel have extremely low sulfur residuals but the cleanliness of the steel is improved considerably and can be compared to vacuum melted steel.—"Rapid Desulfurization to 0.002 Per Cent Sulfur," E. J. Dunn, Jr. Crucible Steel Co. Friday, 9:30 am, Gold Ballroom.

Gray Iron

Altering pig iron production from one grade to another within several hours is one important aspect of the Dwight-Lloyd McWane process. This novel method of producing pig iron from medium grades of iron ore, non-coking coal, and limestone has technical and economic aspects which should appeal to those foundries, or groups of foundries, having a daily production of 300 tons or more. Under special conditions, the process may be applied at even lower tonnages. Various kinds of pig iron, from basic to foundry or even silvery grades, may be produced. This flexibility should interest foundries producing a wide variety of castings and producing nodular iron along with gray iron. Due to the close metallurgical control inherent in the system, direct casting of hot metal produced by the D-LM process is an interesting possibility offering distinct cost advantages.—"The Dwight Lloyd McWane Process for Making Foundry Iron", T. E. Ban, C. D. Thompson, McDowell Co.; B. W. Worthington, McWane Cast Iron Pipe Co. Tuesday, 2:00 pm, Concert Room

Spout temperature of iron can be increased 70-90 F., sulfur content lowered, and melting increased 20 per cent as result of recent German research in which special calcium carbide is injected into cold blast cupolas. The carbide burns in the oxygen of the blast and causes development of a shallow zone of higher temperature just above the level of the tuyeres. Due to improved flowability, thin sections are completely filled and castings have clean surfaces and are free from shrinkage.—"The Use of Calcium Carbide in Acid Cupolas," Rudolph Schulze, Knapsack-Griesheim AG. Tuesday, 2:00 pm, Concert Room.

Inoculation of gray iron with silicon has three very important influences on the metal structure. The eutectic cell size is greatly reduced, graphite is converted to the desireable type A; and practically all the ferrite is eliminated from the matrix. This work brings out the importance of inoculation for achieving better engineering properties in gray iron castings.—"Influence of Inoculation in the Structure of Gray Iron at Various Carbon Equivalents," H. D. Merchant, L. E. Toriello, and J. F. Wallace, Case Institute of Technology. Tuesday, 4:00 pm, Concert Room.

Gray iron foundrymen can eliminate excess mold wall movement in inoculated irons poured in green sand molds. Use of rigid molds like dry sand or core sand molds will curtail this greater wall movement. Investigation shows greater mold wall movement in green sand molds when casting is inoculated than with uninoculated gray iron. Thermal and quench studies during solidification disclose that inoculation reduces thermal gradients and results in earlier formation of the solid skin and less mushy types of solidification. —"Progress of Solidification in Inoculated and Uninoculated Gray Irons," H. D. Merchant, research metallurgist, Owens Illinois, and J. F. Wallace, professor, Dept. of Metallurgical Engineering, Case Institute of Technology. Tuesday, 4:00 pm, Concert Room.

Foundrymen can minimize scrap and optimize profits with a simple dependable chill test for indicating metallurgical structure of cast iron. Chill testing reflects the important influences on casting quality of charge materials, melting temperature, and pouring temperature. Chemical analyses of the metal and cooling rate tell only a small part of the metallurgy story. For the complete picture of casting properties, a chill test belongs in the quality control program of every modern iron foundry.—"Some Factors Affecting the Chilling Behavior of a Roll-Type Cast Iron", Kenneth E. Pinnow and R. W. Lindsay, Department of Metallurgy, The Pennsylvania State University. Wednesday, 4:00 pm, Rose Room

Foundrymen can improve castings through experimental stress analysis. Data obtained from experimental techniques, using stress coat and strain gages can be correlated with material properties. Test work shows that it is important to design a casting to minimize the assembly stress as well as the working stress. It also proves that it is not necessary to make a casting heavy to make it strong. By making the foundrymen a part of the design team and working closely with him it is possible to develop the material so it would satisfy the requirements of easy machining and high strength.—"Development of Engine Castings by Experimental Stress Analysis," L. A. Grotto, International Harvester Co. Wednesday, 4:00 pm, Rose Room.

Ductile Iron

An abnormal type of graphite may occur in nickel-austenitic ductile iron castings which freeze slowly. This type of graphite forms as fine flake-like chunks in the most slowly cooled portions of the casting. The presence of chunk graphite cuts tensile strength 25 per cent and ductility 50 per cent. The iron must be inoculated with calcium-bearing ferrosilicon. A formula is proposed for the adjustment of silicon and nickel contents to assure a spheroidal graphite structure.—"Graphite Structures in Heavy Castings of Nickel-Alloyed Austenitic Ductile Iron," I. Karsay and R. D. Schelleng, International Nickel Co. Thursday, 9:30 am, Room 285.

Investigation reveals that examination of a microscopic coupon from each ladle is still the most satisfactory way of controlling ductile iron. A Ductile Iron Division survey indicated that agreement between laboratories on magnesium analysis in some instances was quite poor. However, there is evidence that with a suitable standard and certain equipment and techniques, the analysis for magnesium can be quite accurate and reliable and magnesium analysis could be used for in-plant production control. Even with an accurate analysis of magnesium content, there are other factors which would make magnesium analysis unreliable as a means of inspecting for quality of purchased ductile iron castings.—"Reliability of Magnesium Analysis as a Criterion of Ductile Iron Quality," report of Ductile Iron Research Committee, A. H. Rauch, Deere & Co., H. G. Haines, Woodruff & Edwards, Inc. Thursday, 9:30 am, Room 285.

Superior mechanical properties are available in very large hypereutectic ductile iron castings. Success, however, depends on inoculation with calcium-bearing ferrosilicon. The improved microstructure achieved in inoculated, hypereutectic, slowly-cooled ductile castings is reflected in better mechanical properties.—"The Effect of the Composition upon Graphite Structure of Heavy Ductile Iron Castings," I. Karsay and R. D. Schelleng, International Nickel Co. Thursday, 4:00 pm, Cafe.

Two new charts can help American foundrymen classify graphite forms in ductile iron. One chart shows

five types of ductile iron graphite designated by Roman numerals. To compliment this chart, it is proposed to use a size chart developed by the German Foundrymen's Association in which graphite particle sizes are designated by Arabic numerals. The combined charts will give the industry a method for describing a particular ductile iron structure or a method of specifying a desired microstructure in ductile iron castings.—"Classification of Graphite Forms in Ductile Iron," Charles K. Donoho, chief metallurgist, American Cast Iron Pipe Co. Thursday, 4:00 pm, Cafe

A working knowledge of graphite formation during solidification of cast irons and as-cast malleable irons will assist foundrymen. It is shown that the form of graphite nucleated and grown is primarily temperature dependent. Iron composition and additional elements function primarily through their ability to influence the temperature of nucleation and circumstances of growth. Investigations were made on the formation of flake, spheroidal, film, lacy and compact graphite. The effect of magnesium, cerium, and other elements on the graphite formation process is described.—"The Formation of Flake, Spheroidal, Film and Compact Graphite During Solidification of Cast Irons," C. R. Loper, Jr., and R. W. Heine, University of Wisconsin. Friday, 9:30 am, Cafe.

Two separate inoculations are essential in as-cast ductile iron for ductility and toughness. First comes the magnesium treatment and second the post inoculation of the graphitizing agent. It is essential that magnesium-bearing ductile iron be inoculated with up to one per cent silicon for the maximum in ductility and impact resistance. The benefits of post inoculation begin to wear off in about three minutes. —"Post Inoculation of Ductile Iron," W. C. Jeffery, products development manager, McWane Cast Iron Pipe Co., and H. D. Bradshaw, associate professor, Metallurgical Engineering, University of Alabama. Friday, 9:30 am, Cafe.

Malleable Iron

Malleable foundrymen can prevent inclusions from low eutectic slags. Research provides an answer as to where this defect is located and the reasons why the odd slags may occur. Malleable foundrymen have similar to those of the steel foundrymen. The similarity and recommended procedures are detailed.—"Shooter, Ceroxide, Cermet, or Slag," C. A. Sanders, American Colloid Co., H. J. Heine, Malleable Founders' Society, R. F. Marande, Ohio Malleable Div., Dayton Malleable Div., Dayton Malleable Iron Co. Tuesday, 9:30, Cafe.

Research in heavy white iron section casting has investigated the use of cerium. The element is revealed as another capable of producing white fractures at carbon and silicon percentages where mottle or gray fractures normally occur.—"Heavy White Iron Section Casting and Annealing," R. W. Heine, professor, and T. W. Mueller, project assistant, Dept. of Mining and Metallurgy, University of Wisconsin. Tuesday, 9:30 am, Cafe.

Malleable iron technology has been advanced through study of as-cast compact graphite in cast iron. Effects of tellerium, bismuth, cerium, and a combination of tellerium and cerium are under investigation. Laboratory studies to date indicate that a combination of cerium and mischmetal and tellurium produce the best as-cast graphite.—"As-Cast Compact Graphite in Cast Iron," R. W. Heine, professor, Metallurgical Engineering, and T. W. Mueller, research assistant, Dept. of Mining & Metallurgy, University of Wisconsin. Tuesday, 4:00 pm, Cafe.

Trace elements are unduly blamed by foundrymen for difficulties in melting, casting, and heat treating. None of six elements studied, Bi, Sb, Sn, Pb, Cd and Zn, influence the rate of first-stage graphitization of white cast irons that would affect commercial operations. None have much influence on the rate of subcritical graphitization of pearlite in the second stage graphitization. Some elements do retard the second stage graphitization reaction whereby austenite is converted directly to ferrite and graphite.—"The Influence of Some Trace Elements on the Graphitization Kinetics of Malleable Iron," G. Sandoz, B. F. Brown, Naval Research Laboratory; W. A. Pennington, University of Maryland. Tuesday, 4:00 pm, Cafe

Die Casting & Permanent Mold

A complete range of aluminum die casting defects have been classified and analyzed from a practical metallurgical viewpoint. Definite recommendations for eliminating each defect have been concisely stated, based upon actual investigation. Mechanical and physical property requirements continue to rise, and there is an ever-growing tendency to attain a still higher degree of automation. To continue progressing along these lines, the optimum practical requirements must be determined, standardized and rigorously applied. Each die caster works out these problems as best he can. If he is successful, the solution remains his secret, if not, the metal is "bad." This new information should help every die caster and enable him to be more competitive through an increased knowledge of the "secrets" of his work.—"Maximizing Soundness in Aluminum Die Castings," L. M. Elijah, The George Sall Metals Co. Wednesday, 3:00 pm, Comstock Room.

Recent die casting advances provide breakthroughs in the light metals industry. A review of several concepts gives assistance to designers in developing the proper location of gates and vents. Use of equations of mechanics and thermodynamics and recent experimental data substantiates Barton's concept of the

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change of kinetic energy into heat with a subsequent thermal rise within the molten metal.—"A Review of Published Data on Metal Flow and Thermal Equilibrium in Die Castings," A. B. Draper, co-director, Metal Casting Laboratory, Pennsylvania State University. Wednesday, 3:30 pm, Comstock Room

Permanent mold breakthroughs allow rapid production with closer tolerances and improved surface finish. The high chilling rates produce castings with better metallurgical characteristics and higher mechanical properties than in sand molds. The same rapid chilling rate also increases the production rate. Proper gating principles necessary for maximum quality and production are outlined.—"Permanent Mold Design," J. Wall, Permanent Mold Die Co. Thursday, 9:30 am, California Room.

Increased quality in aluminum castings is assisted through improved furnace refractories. Research has led to superior types and compositions of refractories resulting in economic and metallurgical advantages. Foundries have assisted supplier-laboratory work in improving the competitive position of the metalcasting industry.—"Aluminum Furnace Refractories," C. H. Schweinsberg, technical sales dept., and J. L. Dolph, research and development, Harbison-Walker Refractories Co. Thursday, 9:30 am, California Room

Tilt-pouring equipment offers several advantages in permanent mold casting. With proper equipment, it is possible to provide uniform, turbulence-free, entry of metal into the mold. By controlling this automatically, one or more of the error-producing "human" factors. In addition to more and better castings, the technique can eliminate a high percentage of labor costs. Machines can be adapted for quick mold change so that short-run jobs may be produced on a competitive basis.—"Tilt Pouring Permanent Mold Castings," Glen W. Stahl, Stahl Specialty Co. Thursday, 9:30 am, California Room

Minor elements in aluminum alloys can be both desireable and harmful to castings. The question of these elements is one of vital importance in securing the greatest economies in the modern aluminum picture. The aluminum casting industry was built upon "smelters ingot" which makes the most efficient use of industrial scrap. It is important that specifications be written around the principle of allowing as much of these elements—iron, zinc, magnesium and manganese—as possible and yet restricting them to an amount that is not harmful.—"Minor Elements in Aluminum Alloys for Die & Permanent Mold Castings," D. L. Colwell, R. J. Kissling, Apex Smelting Co. Thursday, 3:00 pm, Comstock Room

Die casting technology has uncovered a means for eliminating hardspots in aluminum alloy castings. Raising the pouring temperature sufficiently will eliminate this machining difficulty. The problem has been traced to the iron content of the alloy. However, it is not so much the amount of iron as the form in which it is found. Corrective measures will prevent these hardspots which severely impede the machinability of otherwise excellent castings.—"Iron: the Problematical Factor in the Quality of Aluminum Alloy Die Castings," Walter Bonsack, Aluminum & Magnesium, Inc. Thursday, 3:00 pm, Comstock Room

Foundrymen can control inclusions in aluminum alloys. Identification of inclusions leads to easier prevention and identification. Control of these defects is confined to melting and casting whereas detection may be delayed until final machining. Good metal handling practices will result in minimizing or eliminating these defects resulting in higher quality castings and reduced costs.—"Inclusions in Aluminum Alloy Castings," J. M. Fox, research engineer, Aluminum Co. of America. Thursday, 3:00 pm, Comstock Room

New concepts in die casting trim dies put die makers in a more competitive position today. Formerly, trim dies were used only to remove excess material from a casting gate. Now they are expected to trim so clean that plating can follow with no buffing or polishing. Secondary operations may be added to the trim die to cut down handling costs.—"Die Casting Trim Die Procedures," D. Hannah, Hamco Products. Friday, 9:30 am, Comstock Room.

Assessing of casting design and conditions is now possible in zinc die castings. Laboratory techniques provide quantitative information on total porosity volume, distribution within the casting, relative contributions of entrapped gas and shrinkage and gas origin.

G. Sandoz

W. A. Pennington

J. M. Fox

J. L. Dolph

C. H. Schweinsberg

G. W. Stahl

D. A. Craw

G. P. Lewis

R. C. Bell

J. T. Berry

F. E. Murphy

W. F. Moore

These methods may suggest design type and operational changes necessary and provide means for determining effects of alterations. Other applications suggested are weighing the benefits of new casting techniques such as vacuum casting and use of ultra sonics, or aimed at studying problems of metal flow in the die during casting.—"A Study of the Nature of Porosity in Zinc Die Castings," G. P. Lewis, research engineer, D. A. Craw, Electronic Materials Group, and R. C. Bell, Research & Development Div., Consolidated Mining & Smelting Co. of Canada, Ltd. Friday, 9:30 am, Comstock Room

Heat Transfer

Foundrymen can now determine the amount of heat lost by metal as it passes through the sand runner. Basic research provides a formula for determining the heat loss and the temperature of metal when it exits into the mold cavity. The formula also discloses how nine runner design characteristics influence the heat loss.—"How Much of Your Superheat is Being Lost in the Runner?" J. W. Hlinka, senior research engineer; V. Paschkis, professor in mechanical engineering; and F. S. Puhr, research engineer, Columbia University. Monday, 2:00 pm, California Room.

Foundrymen can improve the feeding efficiency of risers and eliminate internal casting shrinkage by pressurizing feeder heads with argon gas at 20 psi. Pressurizing is only recommended for long freezing range alloys where interdendritic or dispersed shrinkage is a problem. Short freezing range alloys such as low carbon steel, aluminum alloy 13, and aluminum bronze need rigid mold walls for maximum internal integrity with minimum feed metal requirements.—"Factors Affecting Casting Soundness in Certain Alloys with Long and Short Freezing Range", T. Watmough and J. T. Berry, Metals Research Div., Armour Research Foundation of Illinois Institute of Technology. Monday, 2:00 pm, California Room

Thermal properties of new mold materials can be easily determined. An Indian investigation uses the unsteady state method involving melting and casting for these determinations. In general heat diffusivity values of mold materials bonded by the CO_2 process will be higher compared to bentonite bonded sands. Silicon carbide has the maximum heat diffusivity and synthetic sand the minimum. Solidification time of test castings calculated from the thermal properties of mold materials evaluated compares favorably with those of experimentally determined values.—"Thermal Properties of Mold Materials," M. R. Seshardri, mechanical engineering section, A. Ramachandran, professor of mechanical engineering, Indian Institute of Science. Monday, 2:00 pm, California Room.

Brass & Bronze

Solving of welding and fabrication problems encountered with Ni-Al bronzes greatly increases opportunities for non-ferrous founders. Not only is the alloy well suited for high-strength propeller castings but with suitable modifications it may well be adopted for important structural and even pressure castings. Also revealed are the relationship between metallographic structure, mechanical properties, and weldability.—"Minor Elements in Aluminum Alloys for Die & Permanent Mold Castings," M. L. Foster and S. Goldspiel, supervisory foundry metallurgists, New York Naval Shipyard. Monday, 9:30 am, Concert Room

Non-ferrous foundrymen, ingot makers, and machinists can avoid hard spots in cast aluminum bronzes. While the nature, cause, and cure of this defect is still a matter of speculation, inspection and shop procedures are recommended so this expensive defect can virtually be eliminated. The unalloyed metallic inclusions are near to diamond hardness and range in size up to 3/8 in. in diameter.—"Hard Spot in Cast Aluminum Bronzes," N. A. Birch, technical director Albion Malleable Iron Co., Monday, 9:30 am, Concert Room.

Satisfactory high-strength, high-ductility welds can be obtained in high-strength yellow brass castings. Experiments were conducted on experimental and production castings which were oxyacetylene gas welded

and inert-gas-shielded arc welded with several different filler metals. Successful results were obtained from inert-gas-shielded arc welding with base metal composition filler and high manganese aluminum bronze alloy filler. Cost reductions will result because fewer castings need be scrapped. In addition, the welding permits design latitude in using a number of smaller castings to produce a complex shape rather than trying to cast it as a single unit.—"Weld Repair of High-Strength Yellow Brass Castings", D. K. Fox, Westinghouse Electric Corp. Monday, 9:30 am, Concert Room

Substantial cash savings in raw material can be realized through close quality control in the low frequency induction melting of bronze alloys. Flow charting and frequent analysis made it possible to raise the zinc content of the 85-5-5-5 alloy, minimizing its fluctuation and achieving a more stable product. Use of new tools such as x-ray fluorescence as a means of rapid chemical analysis proved a definite aid. Information can be valuable to a shop considering an installation and/or running such a unit.--"Electric Melting and Quality Control of Bronze Alloys," R. V. Barone, T. F. Godfrey, R. A. Rosenberg, Walworth Co. Monday, 2:00 pm, Concert Room

Non-ferrous foundries can consistently produce high-quality, high-strength aluminum bronzes with a knowledge of the effect of alloying elements and heat treatment. Data is furnished to assist in selecting an aim point for aluminum content and the foundryman can use information for selecting the quenching and tempering temperatures according to the desired mechanical properties.—"Properties and Microstructures of Cast Nickel-Containing Aluminum Bronze," E. Belkin, materials laboratories, non-ferrous application group, Westinghouse Electric Corp. Monday, 4:00 pm, Concert Room

New high strength bronze casting alloy meets strictest valve stem requirements without heat treating. Cities are enacting tighter specifications for valve stems. This alloy has foundry characteristics similar to manganese bronze and/or aluminum bronze and resists dezincification and dealuminumization. A properly gated, risered and chilled 6-in. valve stem has same mechanical properties in critical sections as those which are available in alloy prepared under test bar conditions. Typical properties are 65,000 psi tensile strength, 33,000 psi yield, and 25 per cent elongation. —"A New High Strength Dezincification Resistant Bronze Casting Alloy," A. H. Hesse, metallurgical engineer, R. Lavin & Sons. Tuesday, 9:30 am, Concert Room

Vacuum Melting & Casting

Practical vacuum induction furnace melting procedures have opened new markets for uranium alloys. Improved molds, casting procedures, and heat treatment have resulted in better processing procedures for utilizing the excess depleted uranium now available. Developments indicate uses for structural purposes, utilizing its high density and optimum properties of strength, ductility, and corrosion resistance.—"Some Theoretical and Practical Considerations in Vacuum Induction Melting of Uranium Alloys," P. S. Schaffer, Watertown Arsenal. Thursday, 2:00 pm, Concert Room.

A knowledge of raw materials specifications is a key to improved vacuum melting. Vacuum melters generally take the stand of purchasing only materials low in gas content and other residual materials. Recommendations are made on the basis of a thermodynamic approach combined with practical operating information.—"Quality Requirements of Alloys for Use in Vacuum Induction Melting," T. F. Kaveny, Union Carbide Metals Co., Div. Union Carbide Corp. Thursday, 2:00 pm, Concert Room.

Metalcasters may materially improve melt quality through various vacuum and inert atmosphere melting and techniques in specialty melting. These processes permit manufacture of alloys not possible by standard air-melting techniques. Advantages and disadvantages of various processes are reviewed for comparative purposes.—"Specialty Melting as a Service Function in a Research Laboratory," W. F. Moore, Metallurgy & Ceramics Research Dept., General Electric Co. Thursday, 2:00 pm, Concert Room

A ladle vacuum degassing unit has been developed to handle 4000-5000 lb of metal. No heat is added during the process. With optimum position of the unit in the shop, the degassing operation should be accomplished in less than 10 minutes. Temperature losses will be proportionately reduced by this improved time and can further be reduced by greater ladle preheating. "Ladle Degassing for Foundry Use," H. S. Philbrick, Jr., John Mohr & Sons. Thursday, 2:00 pm, Concert Room.

A new ingot pouring technique increases tensile and yield properties. The grain structure of a statically cast ingot can be improved by spinning the ingot during the filling and initial solidification period. Further improvements in tensile and yield properties can be achieved by varying the spinning speed during the critical solidification set.—"Induction Melting and Casting," W. A. Matejka, manager, Process Development Dept., Metals Div., Kelsey-Hayes Co. Thursday, 2:00 pm, Concert Room.

Sulfur concentration in vacuum melted steel is so critical it must be kept to a minimum. Recent research now makes it possible to desulfurize a charge, initially high in sulfur by vacuum melting standards, to levels previously attained only by use of elec-

trolytic materials. Investigation reveals that a lime-fluorspar crucible lining results in considerable desulfurization during vacuum refining and that the ductility of vacuum melted low alloy, high strength steel is linearly related to its sulfur concentration.—"Effect of Sulfur and Carbon on Tensile Properties of Vacuum Cast High Strength Steel," J. B. Dabney, American Brake Shoe Co., M. C. Flemings and H. F. Taylor, Massachusetts Institute of Technology. Thursday, 2:00 pm, Concert Room.

Ferrous foundrymen can produce higher quality castings with the induction melting and degassing method. Other advantages include elimination of need for wash heats to clean up furnaces to prevent contamination of subsequent heats and the ability to produce heats consisting of 100 per cent revert.—"300 Kilowatt Induction Melting and Degassing Installation," O. E. Erickson, vice-president, Hanford Foundry Co. Thursday, 2:00 pm, Concert Room.

Fundamental Papers

In the production of steel castings, the feeding distance is strongly dependent upon the degree of soundness required. Research discloses that techniques which promote solidification under steep thermal gradients increase ductility in cast steels as a result of the improved soundness and homogeneity. A summary of research on high strength low alloy steel examines different methods of obtaining directional solidification and effects of solidification variables on structure, segregation, and properties of the cast steel.—"Solidification of Steel Castings and Ingot," M. C. Flemings, assistant professor, M.I.T.; R. V. Barone, research metallurgist, Walworth Co.; S. Z. Uram, foundry metallurgist, Hitchiner Corp.; and H. F. Taylor, Prof. Dept. of Metallurgy, M.I.T. Thursday, 9:30 am, Concert Room.

An equation has been developed to express fluidity of an alloy in terms of metal and mold variables. It describes fluidity behavior of mushy freezing alloys such as aluminum-4.5 per cent copper, both qualitatively and quantitatively. The study shows effects of such elements as titanium, iron, manganese, cobalt, chromium, beryllium, silicon, magnesium, calcium, and copper. Results are interpreted on the basis of liquidus temperature, solidification range, and nature of the primary crystals formed.—"An Experimental and Quantitative Evaluation of the Fluidity of Aluminum Alloys," M. C. Flemings, assistant professor of metallurgy; Eisuke Niiyama, research assistant; and H. F. Taylor, professor of metallurgy; Massachusetts Institute of Technology. Friday, 9:30 am, Concert Room.

The as-cast grain size of 0.14 per cent carbon steel ingots and the as-deposited structure of steel welds are markedly refined by selected additions. These include titanium, columbian, and titanium carbide. As a result strength is increased but ductility and impact resistance were reduced. It is anticipated that heat treatments will be developed to improve ductility.—"Grain Refinement of Steel Castings and Weld Deposits," G. K. Turnbull, D. M. Patton, G. W. Form, and J. F. Wallace, Case Institute of Technology. Thursday, 9:30 am, Concert Room.

Understanding of the metallurgy of cast structures is being advanced through the study of arc deposits. Through this a better knowledge of the freezing process will be obtained. The arc has two valuable features for study. One is that when geometric and boundary conditions are kept simple in the experimental arrangement, a moving arc becomes a fairly precise kinetic calorimeter. A second feature of arc deposition is that solidification obtains under steady conditions. In an arc deposit, the freezing rate is constant along the length of the deposit and can be calculated with accuracy. In a chill casting the freezing rate varies continuously with distance from the chill.—"Structures Produced in Rapidly Solidified Alloys," Paul E. Brown, research associate, Clyde M. Adams, Jr., associate professor, Dept. of Metallurgy, Massachusetts Institute of Technology. Thursday, 9:30 am, Concert Room.

Complicated heat extraction problems are simplified through examples and tabulated data. The results of studies of "external corners" are presented graphically and in tables. They can be used in conjunction with known mold thermal properties and casting dimensions to yield cumulative heat extraction as a function of time, or equivalently, the time of solidification.—"Heat Extraction from External Corners of Metal Castings," K. H. Coats, University of Michigan. Friday, 9:30 am, Concert Room.

Pattern

New technology now permits rapid production of cavity molds or duplicate patterns. Low melting alloys eliminate the need for highly trained personnel or expensive equipment. Bismuth alloys provide high dimensional accuracy and superior finish with savings in manufacturing costs. Changes, alterations, and repairs of matchplates can be made quickly and inexpensively with the low melt alloys. When altering a straight draw solid pattern by addition of a boss, complete rebuilding to a split pattern can be avoided by making a loose piece of a low melting alloys.—"Low Melting Alloys for Pattern Fabrication and Oth-

er Uses in Patternshops," O. J. Seeds, manager, Alloy Dept., Cerro Corp. Monday, 9:30 am, Comstock Room

Machined patterns can be competitive. One of the primary goals of the metalcasting industry is to make more accurate castings over a longer period of time at lower cost. To achieve this goal, it is necessary to have more accurate pattern equipment constructed of more durable materials at the lowest ultimate cost. Ultimate cost includes all money spent by a foundry during the total life of a pattern—the initial cost of the pattern, set-up and sample approval charges, maintenance and repairs, and, last but not least, foundry down time created by pattern failure. —"Machined Patterns Can Be Competitive," Ray Olson, Southern Precision Pattern Works, Inc. Monday, 9:30 am, Comstock Room

Considerable savings are achieved through the use of compounded polyurethanes when high production equipment is involved. The material has a specific application where the ultimate in erosion resistance is a basic requirement. Savings accrue from prolonged dimensional stability, consistently clean and unbroken molds, trouble-free core setting, and reduced welding costs.—"New Concept in Plastic Patternmaking (Polyurethanes)", Harry Burton, Canadian Steel Foundries Ltd. Monday, 2:00 pm, Comstock Room

Non-ferrous foundrymen can increase production of aluminum patterns and core boxes through recommended foundry and machining procedures. Most of the quality problems with cast pattern equipment are encountered when machining operations are necessary. Comments are supplied on reasons for heat treating. Suitable procedures are described as well as composition of a suggested aluminum alloy.—"Aluminum Pattern Castings," W. E. Sicha, chief, Cleveland Research Div., Aluminum Co. of America. Tuesday, 9:30 am, Room 285

A new technology for the shell core process cuts costs on gating changes. The methods, although not as simple as cutting a new gate or riser in a green sand mold, fill the need for examining practical results of the "expert guessing" that is generally the last step in applying gating principles. Also outlined is how published research methods can be modified and applied to specific practical problems.—"Vertical Gating of Bronze Valves in Shell Molds," F. E. Murphy, materials engineer, G. J. Jackson, works manager, Braintree Works, and R. A. Rosenberg, chief materials engineer, Walworth Co. Tuesday, 9:30 am, Concert Room

Plant & Plant Equipment

A 15-step maintenance material control and disbursing system will cut costs and improve maintenance. The steps leading to an adequate evaluation of the need for each item is outlined as well as details of crib arrangement and operation. The program shows management how the systems can best service maintenance department needs and at the same time achieve low production costs.—"Maintenance Materials Inventory Control and Materials Disbursing Systems," K. M. Smith, maintenance manager, Caterpillar Tractor Co. Wednesday, 2:00 pm, California Room.

Safety, Hygiene, & Air Pollution

Shell molding operations can be made safer and more efficient through dust and vapor control. Dividends will accrue from a knowledge of hazardous compounds with their origin and general toxic effects, preparation equipment and its exhaust, determining exhaust requirements and various types of collection equipment. Suggestions are made on exhaust of molding, curing, glueing, and coremaking operations.—"Control of Dust and Vapors from Shell Molding Operations," E. B. Henby, National Dust Collector Corp. Monday, 4:00 pm, Comstock Room.

A new era of air pollution control compliance is now in effect in the San Francisco area. On January 1, a broad air pollution program went into effect in a six-county area. Most melting operations are required to meet each of the limitations contained in three sections: a maximum grain loading rule, a process weight rule, and an equivalent opacity rule. In many instances compilance will be achieved only through the use of high efficiency, small particle collecting, abatement devices.—"Air Pollution in the San Francisco Area," B. Linsky and G. Aase, Bay Area Pollution Control District. Monday, 4:00 pm, Comstock Room.

Industrial Engineering & Cost

Breakthroughs in cost reduction combined with quality control are possible regardless of foundry size. Application of quality control and integration with foundry supervision and traditional methods of trouble shooting will pay dividends. Inspection of foundry processes is routine, and special inspection is applied when lack of control is indicated by difficulty in meeting product quality standards. Cost reductions result through control of scrap losses and reduction of cleaning time.—"Controlling Costs with Better Process Quality Control," C. E. Haney, Esco Corp. Wednesday, 2:00 pm, Room 285.

CHIP MELTING—

Another economical application for induction melting.

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98% or more of the charge is converted to molten metal in AM Induction Melting furnaces. This high recovery rate, together with negligible alloy losses and simple temperature control, produces quality metal at a low cost from chips, borings, turnings and other scrap material.

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The newest combination in Induction Melting equipment — Steel Cage Coreless Furnace powered by a 300 KW Multiductor.

Model S-522-9M, one of 3 Royer Scrap Control Units

TRAMP TRAMP TRAMP

Tramp iron drops out of the picture when you install a Royer Scrap Control Unit. If you're looking for immediate savings in your foundry operations by eliminating tramp iron damage to equipment, castings *and profit*, here's a small investment with a big payoff.

Royer Scrap Controls clean up to 60 tons of shake-out sand an hour. Because they're portable and require no pit, they'll fit your mechanization plans and give production line efficiency.

Send for Bulletin SC-61. It gives the facts and specs on the Model 522 shown and tells you about other foundry units. Royer manufactures a complete line of sand conditioning units to fit any size foundry. Contact us at 155 Pringle Street, Kingston, Penna., phone BUtler 7-2165.

ROYER FOUNDRY & MACHINE CO.

ROYER

Circle No. 161, Pages 137-138

"The industry must face ONE important fact: many engineers, designers, and buyers are afraid of castings."

J. B. Caine Scores Timidity of Designers and Engineers

DESIGNERS AND ENGINEERS will be taken to task this month at San Francisco. When Jack Caine, internationally known consultant, presents the 1961 Hoyt Memorial Lecture, you can be sure that he will criticize them for timidity. And he will also challenge them to become more venturesome.

"The designer and engineer have been taught that castings make second grade parts," says Mr. Caine. "They have been taught that metal must be wrought for maximum physical properties. This teaching is not incorrect if based solely on classical tensile properties. The error involves improper evaluation of the significance of these properties.

"Improper evaluation has been compounded by the apathy of the foundry industry plus human fear of the unknown."

Mr. Caine points out that casting is about the only way that slight changes in shape and size can be effectively incorporated into a metal part to significantly increase its load carrying ability.

It is up to the foundryman to sell the designer on this phase of design. "If streamlined cast design is accepted by the designers it opens up a vast field. The opportunity to cast parts that have never been cast before will be the reward for the foundryman who puts out the effort. He alone has the incentive—more business."

"In many instances, strongest parts that can be made of a given metal at a given hardness are castings."

"It behooves the foundryman to become familiar with at least one phase of design; that of junctions of sections and connecting members."

". . . make castings lead the parade, rather than take a backseat to new, better promoted forming processes."

Gold Medal Awards for 1961

M. C. FLEMINGS, JR.

Mr. Flemings, Assistant Professor of Mettalurgy, Massuchusetts Institute of Technology, Cambridge, Mass., receives the Peter L. Simpson Gold Medal . . . "For outstanding contributions to the industry in the practical application of basic research to production of quality castings, particularly in the light metals field."

Mr. Pellini, Head, Metallurgy Dept., Naval Research Laboratories, Washington, D. C., receives the John A. Penton Gold Medal . . . "For exceptional contributions to the science of metal casting through leadership in fundamental foundry research, particularly in the field of heat transfer and flow of metals."

W. S. PELLINI

Awards of Scientific Merit

H. E. HENDERSON

Mr. Henderson, Technical Director, Research Dept., Lynchburg Foundry Co., Lynchburg, Va., is recognized . . . "For valuable contributions to metallurgical research in the casting of gray iron and ductile iron."

H. J. WEBER

Mr. Weber, Director of AFS Safety, Hygiene, and Air Pollution Control Program, is recognized . . . "For exceptional services to the Society and the foundry industry in directing the SH&AP program for the betterment of the industrial community."

T. R. SCHROEDER

Mr. Schroeder, Foundry Superintendent, Pontiac Motor Div., General Motors Corp., Pontiac, Mich., is recognized . . . "For notable contributions to AFS and the industry in the development of a revolutionary progress for production of cores, and new concepts of automated molding and aluminum processing."

AFS Service Citations

Mr. Toth, Vice-President of Sales, Harry W. Dietert Co., Detroit, is recognized . . . "For his dedication to principles of AFS and long, continuous service to the industry . . . particularly in the field of education."

JESS TOTH

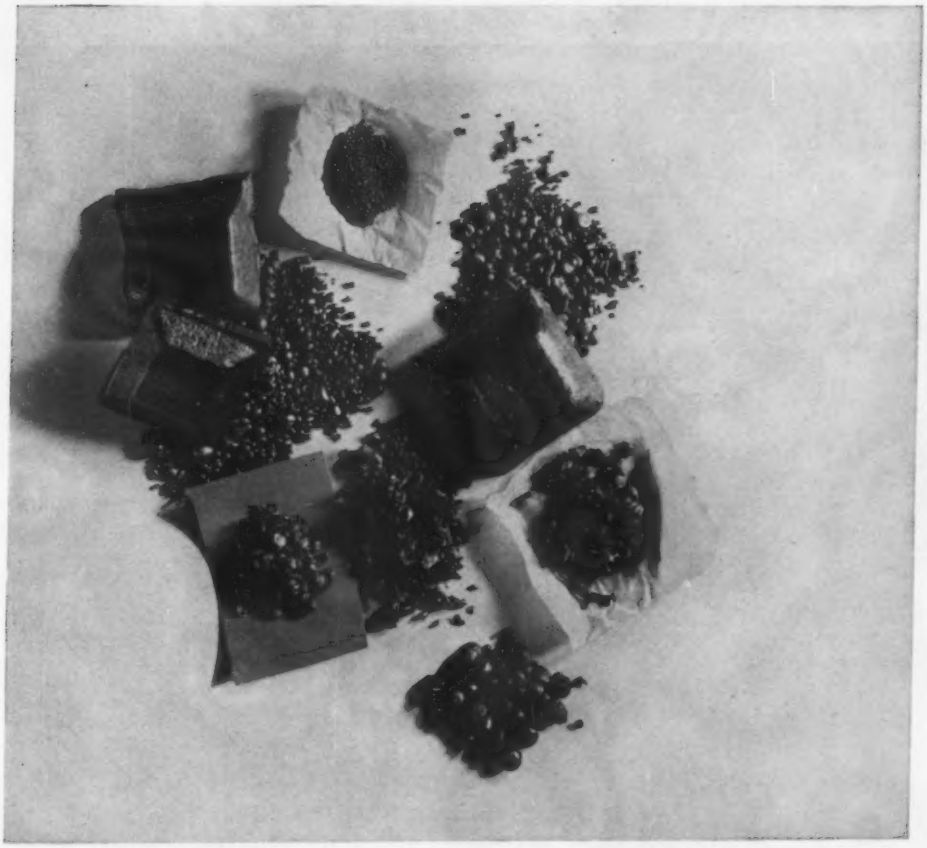
Mr. Smith, Staff Engineer, Caterpillar Tractor Co., Peoria, Ill., is recognized . . . "For noteworthy contributions to the Society and the metal-castings industry in development of engineering principles to make the foundry 'a better place to work.'"

K. M. SMITH

Mr. Barczak, Operations Vice-President, Superior Foundry, Inc., Cleveland, is recognized . . . "For outstanding and inspirational services to AFS, its chapters and the ferrous industry, for inspirational encouragement of young men to foundry careers, and for constant willingness to help the other fellow."

A. D. BARCZAK

ASARCO ALLOY ADDITIVES



Improved alloys at less cost with "ready to add" master alloys

Asarco alloying materials, produced under strict metallurgical controls, reduce alloying costs, improve casting performance, and contribute substantial savings in subsequent production costs.

BISMUTH is used to improve the dispersion of graphite in malleable iron castings. Available in shot, pellet and ingot forms.

SELENIUM improves machinability of stainless steel, controls its porosity. Asarco master alloys include ferro-selenium and nickel-selenium containing 50-60% selenium, and selenium powder.

TELLURIUM is used for degasifying, to minimize porosity, and improve machinability of stainless steel. It is also used for producing hard chilled iron castings. Ferro-tellurium containing 50-58% tellurium is available in chunk form. Tellurium is also available in powder, stick, slab and tablet forms.

Federated Metals Division produces and sells:

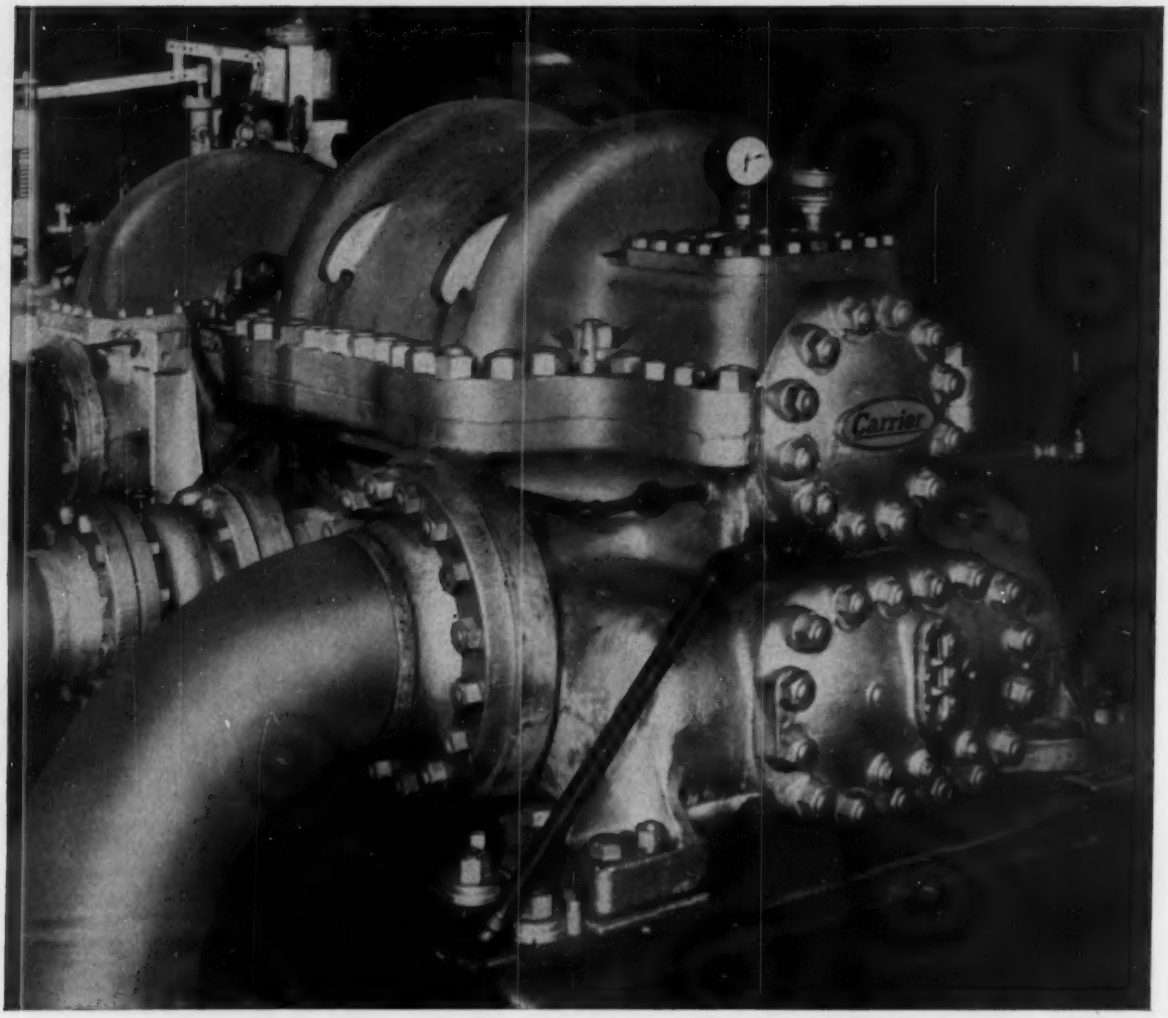
PELLET LEAD, readily assimilated into molten steel, dissolves into finely dispersed particles which lubricate and result in faster, smoother machining, longer tool life.

PHOSPHOR COPPER used as a deoxidizer, in shot or waffle form, improves castability, assures sharper detail, reduces porosity.

OTHER ALLOY ADDITIVES produced by Federated are: Aluminum, Arsenical Copper, Chromium Copper, Copper-Nickel Shot, Manganese Copper, Silicon Copper, Titanium Aluminum, Copper Magnesium, Copper Shot, Cadmium Copper, Copper Iron, Aluminum Copper.

For complete information, write on your company letterhead to: Federated Metals Division, American Smelting and Refining Company, 120 Broadway, New York 5, New York.

ASARCO



4½% Nickel plus good casting makes these casings strong and tough at –185°F

Here's how the foundry solved a low temperature problem:

This Carrier #350 Compressor is designed for producing ethylene by low temperature (–185°F) high pressure (600 psi) fractionation.

Under these conditions ordinary cast steel is brittle and could easily fracture. Could the foundry turn out castings which would have high strength and toughness at the low temperatures involved?

They could . . . this way:

They made these three-ton compressor housing castings from 4½% nickel alloy steel; normalized and water quenched them, and finally tempered them. Under this treatment the castings easily exceed these minimum mechanical properties:

Ultimate tensile strength	70,000 psi
Yield strength	40,000 psi
Elongation in 2"	22%
Reduction of area	30%
Charpy keyhole impact (@ –185°F)	15 ft. lb.

Nickel does wonders for cast irons and steels destined for severe service . . . aids development of desired metal structure.

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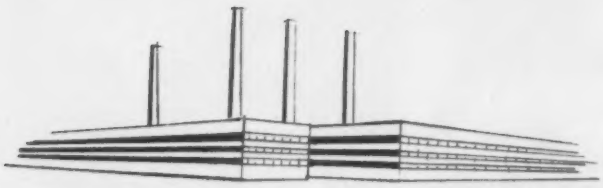

Exhibition-in-Print

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THE ADAMS COMPANY
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The Adams Co. produces a complete line of molding machines, molding flasks and jacket equipment. The Adams packets are available in steel, cast iron, or cast aluminum and are made from top-grade metals best suited for this purpose. The sturdy construction—as a result of the carefully designed ribbing—plus handles at either end, assures the foundryman long equipment life plus easy handling.

Adams' "Cherry Easy-Off" flasks and aluminum "Easy-Off" flasks are available with pin and ear arrangements to suit your present pattern plate guides. The Adams Co. has been serving the metalworking industry for 78 years and consistantly seeks to offer improved quality products.—Phillip Adams, president. For more information circle No. 26 on Reader Service Card.

ADJUST-A-FRAME CORP.
903 Leesburg Pike, Falls Church, Va.

In principle, the adjustable manhole is a device that can be raised, lowered or tilted to conform to the crown and grade of any roadway. Vertical adjustment is plus or minus three inches. In actual setting of the frame, a total vertical adjustment of six inches can be obtained. No "digging up" of the surrounding pavement is required to obtain this adjustment. Simply remove the cover and adjust to the desired height and pitch by rotating the five bolts with a common socket wrench or an automotive "wheel lug" wrench.

The Adjustaframe will pay for itself the first time it is adjusted and continue to save re-set costs each time it is adjusted. It can be amortized in two years and save the taxpayers money from that time on. There is also a saving in initial setting of the adjustable frame if the top of the manhole is not built to the exact height.

The adjustable frame has been developed for yard inlets and parking areas, water and gas meter boxes, and any other type of casting that goes in the street. This concept is applicable in virtually every configuration of street-type casting in common usage today.

Casting for casting, the Adjustable Manhole Frame requires more iron per installation than the old-fashioned manhole. This means more dollars for the foundryman—Alfred L. Jaeger, vice-president, sales. For more information circle No. 19 on Reader Service Card.

THE AIRETOOL MANUFACTURING CO.
Springfield, Ohio

Adding to its expanding line of pneumatic production equipment and improving models already in the line, the Airetool Mfg. Co. keeps moving ahead to supply its customers with the best in the field.

New equipment includes a precision midgit grinder kit which is ideal for precision tool and die grinding. There is a choice of 38,000 or 60,000 RPM vane-type motors to insure control under all phases of use. The Model 700-V Vertical Pneumatic Grinder has been improved by the addition of a revolving cup wheel guard which affords greater protection.

The company has also improved its Model 600-V Vertical Pneumatic Grinder. This light, compact grinder now has the revolving wheel guard protection. Additional information concerning these or other units in the Airetool line can be received from the company or by contacting an Airetool representative—I. T. Thornson. For more information circle No. 17 on Reader Service Card.

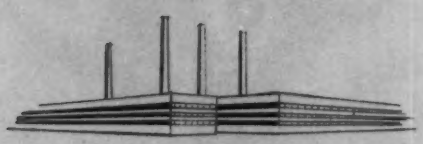
AJAX MAGNETHERMIC CORP.
P.O. Box 839, Youngstown, Ohio

Ajax supplies all types of induction melting furnaces including: core, coreless, lift, and automatic pouring. A variety of power sources are available: 60 cycle, motor generator, mercury arc converters, R.F. generators, and the new 180 cycle Multiductor. Melting capacities range from 8 ounces to 8 tons. For more information circle No. 42 on Reader Service Card.

ALABAMA BY-PRODUCTS CORP.
P.O. Box 384, Birmingham 2, Ala.

For over 40 years, Alabama By-Products Corp. has produced ABC Foundry Coke—a highly specialized melting medium, constantly and consistently improved through practical research and application to meet better and more feasibly the ever-increasing rigid quality requirements of the competitive foundry industry. Non-captive operation and large capacity have enabled ABC to supply its foundry customers dependably, even during the most extreme periods of coke shortage.

ABC Foundry Coke is now available in five distinct types: one for highest carbon pick-



up; one for intermediate carbon pick-up; and three types for lower carbon ranges. Only ABC offers this complete product line and services its use with a staff of experienced melting engineers.

Unique also is ABC's cupola control of coke quality at its coke plant. This practical, timely test for carbon pick-up and temperature correlates with performance in actual operation and supplements conventional laboratory controls of coke quality. Foundry coke controlled for all types of cupola melting is available—Alex Bolvig, Jr. For more information circle No. 7 on Reader Service Card.

ALAN WOOD STEEL CO.
Conshohocken, Pa.

Alan Wood Steel Co. produces three types of pig iron, foundry, malleable, and intermediate low-phosphorus. Substantial stocks are maintained in all standard analyses assuring competent service on any size order, time after time. Technical services available. For more information circle No. 101 on Reader Service Card.

ALLIED CHEMICAL & DYE CORP., SEMET-SOLVAY DIV.
40 Rector St., New York 6, N. Y.

Optimum performance of coke in the cupola is the direct result of quality control from the mine all the way to the cupola itself. Semet-Solvay makes sure by making tests along every step of the way—chemical, pyrometric, and physical. Shatter, specific gravity, and porosity control result in a coke that is low in ash and sulfur, high in carbon, and uniform for the most efficient cupola operation.—A. F. Scherm, president. For more information circle No. 59 on Reader Service Card.

ALLOYS & CHEMICALS CORP.
4363 Bradley Road, Cleveland 9, Ohio

As a leading aluminum smelter, our company is operating with advanced smelting methods and is equipped with furnaces and processing equipment of the most modern and efficient design in order to insure maximum quality control. As a result of more efficient furnaces and the adoption of improved cleaning methods, foundries using metal made by A&C will experience reduced melt loss.

Metallurgically, our controls encompass a complete analytical laboratory, production control quantometer, research spectrograph, and associated metallurgical instruments. Through A&C's efforts in controlling grain size and in producing gas-free metal, the foundryman can produce castings of higher strength.

All alloys are strapped and self-palletized for economical fork-lift handling and convenient storage. They are shipped packaged in polyethylene to protect the metal in transit. A&C maintains a complete warehouse inventory in the heart of industrial America to provide prompt, dependable delivery service —Milo L. Phillips, vice president and technical director. For more information circle No. 22 on Reader Service Card.

AMERICAN COLLOID CO.
5100 Suffield Court, Skokie, Ill.

For many years American Colloid sold only bentonites to the foundry trade—Volclay and Panther Creek, synonymous with good quality. Recent standard products include Five Star wood flour, Klean Surf iron ore oxide, and Green Shell Carb. During the past two years a new cellulose additive Cellflo has been marketed.

New products include:

1. Colloidrez which includes a complete line of resins formulated to specifications including phenoformaldehyde, ureaformaldehyde, and hot box resins.

2. Colloid 716—a bentonite-based formulation used in production of green sand using oil rather than water. For non-ferrous only.

3. Redi-Line—a prepared refractory ladle lining mixture. Simply ram into ladles for long life with economy.

4. Redi-Core—an especially formulated core sand mixture for elimination of veining and metal penetration. Different formulations are used for brass, gray iron, or steel.

Advancement in the foundry industry depends on the successful application of ideas, materials and methods. Our new products are the result of intensive research and development. They are materials that are needed in the foundry industry, produced by experienced personnel and backed by years of foundry know how. The application of new ideas and new materials in the proper place in the foundry result in better castings for less money.

We invite your inquiry—C. A. Sanders, vice-president. For more information circle No. 73 on Reader Service Card.

AMERICAN FOUNDRY FLASK CO.
2745 Southwest Blvd., Kansas City 8, Mo.

All styles of foundry flasks produced by American are made from controlled specification plates and formed in one piece in perimeter and depth.

Specially designed offset dies eliminate corner forming stresses. To provide extra duty durability, the flasks are of all-welded construction. For more information circle No. 91 on Reader Service Card.

AMERICAN SMELTING & REFINING CO.
120 Broadway, New York 5, N. Y.

A new grade of aluminum casting alloys, in which shrinkage tendencies are substantially reduced and controlled, has been developed by American Smelting & Refining Co. by means of a special refining technique. The new PT (for "pressure-tight") grade metal is available as an alternative to any of the standard aluminum sand and permanent mold casting alloys. It substantially reduces variable and unpredictable shrinkage commonly encountered in aluminum foundry work and eliminates the need for extra gates and risers. The unusual degree of casting control possible with the PT grade alloys results in more uniform pressure-tight castings. In addition, castings have a brighter, cleaner surface because of reduction in surface shrinkage.

The process does not effect physical and mechanical properties; machinability or heat treatment characteristics. Tests by commercial foundries have shown by use of the new PT grade alloys results in lower reject rates, fewer production steps required to produce a given casting, and a higher yield of finished castings per pound of metal poured. For more information circle No. 69 on Reader Service Card.

ARCHER-DANIELS-MIDLAND CO.
2191 W. 110th St., Cleveland 2, Ohio

Seeking to improve casting technology and reduce foundry costs, Archer-Daniels-Midland Co., Federal Foundry Supply Div., has introduced the following products:

Chem-Rez "100," a high-speed furan binder for "hot box" curing, dielectric or oven baking systems. Cost is estimated to be about 30 per cent less than cores made by the phenolic shell system. Hot box cores can be stripped in seconds after blowing. Cores are strong, hard, moisture-resistant, and dimensionally stable, resulting in smooth, accurate castings with pattern-true finishes.

Chem-Rez "A-200" is used in making large chunk cores. Benefits include fast curing at room temperature, quick stripping of corebox—usually within 45 minutes after ramming —and reduction in number of reinforcing rods.

"Velva" Washes, a new series of high refractory washes, offer velvet-smooth finishes under extreme temperatures. Velvalite ZA 2 is a highly refractory Zircon wash for steel work and very heavy section iron. Velvalite GA 2, a graphite-based wash, is ideal in gray iron and semi-steel foundries, and it has excellent steel suspension characteristics. Velvawash MW 2 is a mica-graphite wash with resistence to all gray iron pouring temperatures—Robert J. Mulligan, manager of marketing. For more information, circle No. 4 on Reader Service Card.

ATLAS TESTING LABORATORIES, INC.
1225 E. 63rd St., Los Angeles, Calif.

More foundries are turning to high speed spectrographic chemical analysis for quality control of melt composition. Stainless steel casters will find our 300 Series (including C, P, S) spectrographic standards especially

See Suppliers' Directory on Page 139

suited to their needs. For more information circle No. 92 on Reader Service Card.

BARIOD CHEMICALS, INC.,
SUBSIDIARY OF NATIONAL LEAD CO.
1809 South Coast Bldg., Houston 2, Texas

Bariod Chemicals recognized the need for a method of producing precision castings using equipment and skills found in the average foundry. The result was PETRO BOND bonding agent, a formulated material that acts as a sand-bonding agent in the presence of oil. No water is required. This permits the use of fine-grain sands because of less gas and vapor. Molds shake out fast and sand doesn't stick to castings. Pattern reproduction from Petro Bond molds is exceptionally accurate, and castings are sounder and have less porosity.

Petro Bond sand consists of a mulled mixture of fine sand, oil, Petro Bond, and a small amount of a catalyst—usually methyl alcohol or catalyst P-1. Sands mixed with Petro Bond are reusable and can be rebonded. Only conventional green sand molding equipment and skills are necessary.

Foundries using Petro Bond in both heap and complete sand systems report superior castings with standard equipment. High-precision castings for industries such as aircraft, electronics, hardware, railroad and others are now being produced. Bearings, valves, pump housings, pressure nozzles, impellers, plaques, dies and piston rings have all been made successfully. The cleaning process is simple since, in most instances, retained sand can be blown off with an air hose—Donald L. Moore, sales manager. For more information circle No. 9 on Reader Service Card.

BEARDSLEY & PIPER, DIV. OF PETTIBONE MULLIKEN CORP.
2424 N. Cicero Ave., Chicago 39, Ill.

Always abreast of the latest developments in the foundry industry, Beardsley & Piper has, within recent months, introduced new machines for the two newest processes in coremaking—shell and furfural or "hot box." Two sizes of Cormatics for hollow shell and a complete line of Flexiblomatics for the hot box process provide the most productive and highly automated units at low initial cost while accommodating a full range of core box sizes.

These units supplement B&P's line of equipment to form the most comprehensive offering of foundry machinery of any manufacturer in the industry. In molding equipment the Sandslinger line of stationary and motive machines, long the standard of the industry, provide hard, uniform ramming for any production or jobbing work.

Rol-A-Draws, floor-mounted, fully hydraulic rollover and draw machines, are available in mold sizes up to 15,000 lbs. The Speedmuller, using rubber to rubber mulling and the principle of centrifugal force, has provided the industry with the only really new development in mulling.

Although B&P has stressed the new processes in coremaking, the well-established line of Flexiblos provide unmatched speed and flexibility for other processes such as oil sand and CO_2. The line of molding equipment runs from the smallest to the largest—C. V. Nass, vice president and general manager. For more information circle No. 23 on Reader Service Card.

BERKSHIRE CHEMICALS, INC.
630 Third Ave., New York, N. Y.

For optimum as-cast surface finish on steel castings our zircon sand is tops. Refractory washes made of zircon flour eliminate burn-in at hot spots in molds and on cores. For more information circle No. 86 on Reader Reader Service Card.

BESTWALL GYPSUM CO.
Ardmore, Pa.

Bestwall #1 Metal Casting Plaster is the finest metal casting plaster ever developed. Non-ferrous precision castings can be made in this material with tolerances of 0.0025 inches per inch; in sizes ranging from 6 to 36 inches; and 0.50 micro-inch finish on aluminum castings. For more information circle No. 44 on Reader Service Card.

BROWN BOVERI CORP.
19 Rector St., New York 6, N. Y.

Now offering the U.S. market a full range of line frequency coreless induction furnaces in proven designs for every metal, with outputs as high as 19,000 lbs/hr for gray iron and aluminum.

To assure the perfect mating of equipment to every application and operating condition, Brown Boveri also offers a complete range of medium and high frequency furnaces of all types; arc furnaces, resistance furnaces, radio frequency generators and complete accessories (including automation equipment). These units are backed by thousands in successful operation and 70 years of experience in electrical and mechanical power equipment.

One of the world's most extensive research and development programs in electrics and metallurgy assures full unit responsibility and excellent coordination of every installation—T. T. Lucier. For more information circle No. 3 on Reader Service Card.

BUEHLER, LTD.
2120 Greenwood St., Evanston, Ill.

Polimet—a new name in metallographic polishers. With infinitely variable speed over a wide range, it is possible for the operator to select the exact speed desired for a particular sample. The speed range is controlled by turning a knob—which eliminates the source of most vibration, since there is no mechanical clutch, belts or pulleys involved in the operation. The electronic control has only one vacuum tube and the complete circuit is mounted on a small panel easily accessible on the outside of the motor.

Three new pieces of metallurgical specimen preparation are now available for foundry laboratories. The Supermet grinder for samples having relatively rough surfaces; the Surfmet, a smaller unit, a belt grinder intended for bench mounting; and the Simplimet Press for fine grinding and polishing.—G. W. Graves, vice-president. For more information circle No. 87 on Reader Service Card.

THE CAMPBELL-HAUSFELD CO.
Harrison, Ohio.

Campbell-Hausfeld Co. specializes in nonferrous melting furnaces, both gas and gas or oil fired types. Three types illustrate the line. 1)—Single burner stationary crucible furnaces, gas fired, for brass, bronze and aluminum-crucible sizes, 10-400 lb. 2)—Tilting and stationary, single burner, gas or oil fired crucible furnaces for aluminum melting; crucible capacities, 200-1000 lb. 3)—Single burner, tilting crucible furnaces, oil fired, for brass and bronze; crucible sizes 40-400 lb. Hausfeld "Furnace Tips" booklet covers the do's and don'ts of good melting practice for non-ferrous foundries.—Clyde E. Small, vice-president. For more information circle No. 79 on Reader Service Card.

THE CARBORUNDUM COMPANY
Executive Offices, Niagara Falls, N. Y.

Higher yields of strong, dense, consistently more machinable castings are possible through the use of "Ferrocarbo Briquettes", the cupola deoxidizer containing an expanding agent, catalyst and slag activator.

The expanding agent causes disintegration of the briquettes, assuring maximum distribution of their active ingredients at temperatures which provide optimum reaction with molten metal and slag. The catalyst promotes faster and more complete reaction of the briquettes' active ingredients, and the slag activator lowers the viscosity of the slag which assures rapid and uniform distribution of the briquettes throughout the slag and promotes absorption of the sulfur from the iron.—K. F. Ford. For more information circle No. 27 on Reader Service Card.

CARVER FOUNDRY PRODUCTS
1054 Hershey Ave., Muscatine, Iowa

Carver presents a complete line of products for CO_2 mold and core production. Included are the Carver Rapid Mullers, which works equally well with any binder; core shooters; automatic gassing apparatus; self-cleaning taper slot core vents; and an exclusive low-cost CO_2 binder.

"Steinex," Carver's CO_2 binder offers the

best shakeout possible, yet it is 30 per cent lower in cost. The Carver Rapid Muller works with any binder—CO_2, Bentonite, facing sands, oil core sands, and oil bonded molding sands. With the carbon dioxide process, a batch can be made every 75 seconds, while oil sand may take up to three minutes—Roy Carver, president. For more information circle No. 28 on Reader Service Card.

CERIUM METALS & ALLOYS DIV., RONSON METALS CORP.

45-65 Manufacturers Place, Newark 5, N. J.

CerAlloy 100 (mischmetal) consists of mixed rare earth metals which include cerium, lanthanum, neodymium, and praseodymium plus traces of the remaining 11 rare earth elements. It has several important uses in metallurgy. In ductile iron it helps to control subversive elements, and may be added either separately, or contained in silicon-magnesium-mischmetal or other alloys. In cast steel, it improves ductility and impact properties and modifies inclusion types.

In stainless steel, it improves hot workability and forgeability of special grades, which are otherwise difficult to fabricate. In precision castings, mischmetal improves fluidity and castability in a wide variety of metals, including low-alloy steel, cobalt-base alloys, aluminum alloys and copper-base alloys. In magnesium alloys, it improves high-temperature properties and reduces porosity. In aluminum castings, it refines the grain and increases the strength of highly alloyed aluminum.—W. A. Otis, sales manager. For more information circle No. 76 on Reader Service Card.

CLEARFIELD MACHINE COMPANY
P.O. Box 249, Clearfield, Pa.

Equipment manufactured by the Clearfield Machine Co. is well-known in the field of metal castings and has enjoyed a reputation of producing quality sands as well as quantity for a minimum maintenance cost.

We are now offering Clearfield Mixers to be used in continuous mixing of foundry sands for installations requiring high tonnages of content. High production can be obtained in these mixtures due to the unique design of the bowl shaped revolving rim with a rotating disc which acts as a means of turning the material over upon contact with it, and as a device to clean the rotating bowl every revolution, preventing build-up of material on the rim. There is also an agitator of five-arm design which breaks up the packed track of material (formed by the mullers), and mixes it in with other material flowing past it.

By keeping all of the material in motion and acting upon it at several points each revolution, we are able to get very fast, efficient mixing. Discharge onto a belt conveyor or into an elevator is obtained by the use of a revolving disc which lifts the material over the top of the rim, giving some aeration during the process and providing additional height at this point to facilitate the location of an elevator or conveyor with a minimum of pit requirement. We are happy to receive inquiry about equipment of this nature—R. K. Quigley, vice president. For more information circle No. 29 on Reader Service Card.

THE CLEVELAND FLUX CO.

1026-40 Main Ave., N.W., Cleveland 13, Ohio

Our company manufactures metallurgically controlled fluxes for the entire metal melting industry. Predetermined formulas, based on full knowledge of the basic requirements of good melting practice, have been established during a period of over 45 years of service to the foundry industry.

Molten metal fluxes are our only business. Our full time is spent in perfecting these products to meet the consumers' needs. Good, sound technical service is available to all users.

Cleveland Flux products are used and known by thousands of foundries. Ask your nearest foundry friend, or neighbor—he knows about our fluxes. By writing us, you'll learn that using our fluxes will not add to the cost of your melting operation—in fact, it will prove that a high rate of economy is realized, not only in your melting operation but in the machine shop as well—Frank P. Volgstadt, president. For more information circle No. 13 on Reader Service Card.

CORN PRODUCTS SALES CO., INDUSTRIAL DIV.

10 E. 56th Street, New York 22, N. Y.

In addition to a time-tested line of dry and liquid core binders, including an additive designed for the CO_2 process, Corn Products offers foundrymen information on more efficient processes, technical service, and guidance. The emphasis is on new and improved products, backed by our complete research and testing facilities—C. J. McDowell. For more information circle No. 30 on Reader Service Card.

CRUCIBLE MANUFACTURERS ASSOCIATION
11 W. 42nd St., New York, N. Y.

Crucible melting costs less, casting for casting, ton for ton. Send for your free "Crucible Charlie" pamphlet "Getting the Most from Your Crucible Melting" by circling No. 85 on Reader Service Card.

DEBARDELEBEN COAL CORP.
2201 First Ave., N., Birmingham 3, Ala.

Empire Coke is produced for the foundry trade in sizes precisely tailored to the several types of cupolas in operation. Our plants are located on several major rail lines, on navigable waterways and on main highways to insure quick delivery and dependable service when the customer needs it.—N. H. DeBardeleben. For more information circle No. 31 on Reader Service Card.

DEPENDABLE SHELL CORE MACHINES, INC.

1634 S. E. 7th Ave., Portland 14, Ore.

The company now produces five machines, the 100, 100-S, 200, the new 200-A, and the 400, each designed to produce cores with excellent permeability, collapsibility, and accuracy—as well as offering easy shakeout.

The 200-A is designed for foundries requiring the ultimate in high production of shell cores at the lowest possible capital investment and operating expense. It features push-button operation, and it affords fast and economical production of a wide variety of shell cores with a minimum amount of attendance by the operator.

It uses natural, manufactured, or bottled gas, thermostatically controlled, with the heat applied directly against the corebox. Simplicity in design and rugged cast construction reduces maintenance to a minimum.

Models 100-S and 400 are available as fully automatic or with selected automatic features. "Special" models offer sand tank capacity up to 550 lbs. Each model is shipped completely equipped and assembled—Fred M. Menzel. For more information circle No. 32 on Reader Service Card.

HARRY W. DIETERT CO.

9330 Roselawn Ave., Detroit 4, Mich.

A Moldability Controller that attaches to the outer shell of a sand mixer has been developed that automatically adds ingredients such as slurry, water and/or bonds to the sand in the mixer until a predetermined moldability of the sand is secured. As return or new sand composition changes during the day, the Controller automatically maintains a constant moldability or workability of the sand. It uses the single principle of sand screening. A small stream of sand flowing through a small hole in the mixer shell falls on a vibrating screen. Sand falling through the screen is dropped on one side of an inverted "V" continuous weighing device and sand moving across the screen falls on the other side of the weighing device. The two flows are weighed out against each other.

The unit will automatically adjust the moisture as sand composition fluctuates so that sand of a constant moldability is delivered. The quality of the molds is improved since the sand is prepared not necessarily to a constant moisture percentage but prepared to a constant ramming sand.—Jess Toth, vice-president. For more information circle No. 74 on Reader Service Card.

DUREZ PLASTICS DIV., HOOKER CHEMICAL CORP.

8903 Walck Rd., North Tonawanda, N. Y.

Durez Plastics Division has been awarded a United States patent for a new sand-coating process that represents an important contribution to the production of metal castings.

The company will share the new process for coating sand particles with a thermosetting phenolic resin with the American foundry industry. The process simplifies resin-coating procedures and permits the use of standard equipment. It permits the use of either powdered phenolic resins or resin solutions for sand coating purposes. The entire coating process can be conducted cold or accelerated with hot air. Unlike other methods, the process involves no chemical reactivity, and as a result, duplication of batches and product control are simplified.

The sand-coating method involves mixing sand, powdered resin, alcohol and water in controlled proportions or a predissolved solid resin in a mixture of alcohol and water. The company recommends that sharp-grained sands

Use Reader Service Cards on Pages 137, 138

dependable Molybdenum in the foundry

Primary justification for increased success in foundry applications of molybdenum is found in the dependability of results. Day after day the foundryman gets the results he needs by adding molybdenum to his melt. Molybdenum may be added to improve tensile and transverse strength, increase impact and fatigue strength, improve wear resistance, increase toughness and strength at higher temperatures, intensify effects of other alloying elements.

The consistency of results in production justifies confidence in MCA molybdenum.

MCA closely controls all of its manufacturing steps and the chemistry of its molybdenum products, hence the uniformity of results.

Complete stocks of molybdenum in all of its metallurgical forms are available through MCA. Technical assistance in meeting tough specifications or solving specialized problems is yours upon request. No obligation, of course.

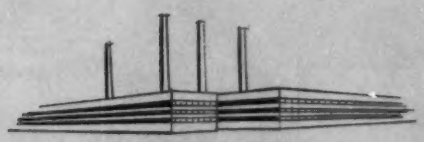
MOLYBDENUM

CORPORATION OF AMERICA

1312, Building Number 4, Gateway Center, Pittsburgh 22, Pa.

Offices: Pittsburgh, Chicago, Los Angeles, New York, San Francisco
Sales Representatives: Brumley-Donaldson Co., Los Angeles, San Francisco
Subsidiary: Cleveland-Tungsten, Inc., Cleveland
Plants: Washington, Pa., York, Pa.

Circle No. 196, Pages 137-138



with low fineness and clay content be used in the process. Solvents used with the Durez resins may be selected from the group comprised of methyl alcohol, ethyl alcohol, isopropyl alcohol, n-propyl alcohol, acetone, methyl acetate or mixtures thereof. Full details of the process can be obtained by writing the company— Douglas Burdick. For more information circle No. 66 on Reader Service Card.

EASTMAN KODAK CO., X-RAY DIV,
343 State St., Rochester, N. Y.

Kodak Industrial X-Ray film, type AA and type M in 16mm, 35mm, and 70mm widths, 200-foot lengths, are now available in "Ready Pack" rolls. This means the film is kept clean and sealed, ready for use in light-tight disposable envelopes. It eliminates darkroom loading. The roll film provides a convenient method of radiography of thin-wall vessels and pipes, honeycomb, circumferential welds and the like. The 35mm rolls are especially time-saving in the non-destructive testing of long pneumatic and hydrostatic tubes for aircraft construction.

The film needed is unrolled, cut off and the ends sealed with opaque, pressure-sensitive tape. This method allows inspection of aluminum or magnesium alloys, thin steels or anything where lead screens are not required. Radiography is one of the ways that foundries, large or small, can make certain that only high-quality work goes to their customers. It builds a business reputation and it builds a bigger business.—William D. Kiehle, manager, Industrial X-Ray Sales. For more information circle No. 34 on Reader Service Card.

FANNER MANUFACTURING CO.
Brookside Park, Cleveland, Ohio

We offer the foundry industry the most complete line of chaplets and chills available anywhere. In the Fanner chaplet line are developments through which Fanner engineering has produced improved casting procedures—including stem deformations, motor chaplets, extended stems, cross heads, staggered nicking, perforated heads, and protective coating.

Especially to be noted is the exclusive Fanner Groovestem Chaplet with features that provide assured core support, maximum fusion, freedom from leakers, and accurate wall thickness.

In the field of chills, Fanner offers a full range of types—including coil chills, superchills, radius and ram-up chills, and the widely used Fan-S-Chills. To assist in the selection of chaplets and chills, Fanner offers a handy chaplet selection chart and two different wall hangars showing a variety of the most popular chaplets and chills and the sizes in which they are available—T. E. Butz, president. For more information circle No. 60 on Reader Service Card.

FOSECO, INC.
P. O. Box 8728, Cleveland 35, Ohio

Foseco is primarily a manufacturer of compounds for treating molten metal, molds and dies. It has a complete product line for foundries. Its principal product is Feedex, moldable exothermic riser compounds for ferrous and non-ferrous casting with widespread application in the form of hot top. Foseco is also a leading producer of degassers, alloying additives, deoxidizers, inoculants, grain refiners, coatings and protective and dressing fluxes. Compounds are formulated in various grades and types for particular application.

The company maintains extensive laboratory facilities for technical service to metal producers with complete instrumentation and personnel staffing for casting analysis. The service is offered to foundries without obligation.—Jack Hanna, technical service. For more information circle No. 57 on Reader Service Card.

FURANE PLASTICS INC.
4516 Brazil St., Los Angeles, Calif.

Epocast tooling plastics for patternmakers are specially formulated for casting in any thickness with low shrinkage and low heat evolution. Used for making core boxes, match plates, and cope and drag patterns suited to rugged service in blowers, shooters, and slingers. For more information circle No. 46 on Reader Service Card.

GENERAL DYNAMICS CORP., LIQUID CARBONIC DIV.
135 S. LaSalle St., Chicago 6, Ill.

General Dynamics' Liquid Carbonic Division reports that continued growth of the CO_2 process for cores and molds during the past year has saved time and space for many foundries. In addition to offering CO_2, nitrogen, oxygen and acetylene to the metal-casting industry, Liquid Carbonic Division has increased the scope of its Liquidweld apparatus line to include varieties of torches and pressure regulators to best serve modern foundries.—W. E. Price, advertising manager. For more information circle No. 81 on Reader Service Card.

GENERAL FOODS CORP., CORN MILL DIV.
Kankakee, Ill.

At the turn of the year General Foods Corp. introduced a new binder flour to the foundry industry. Interest and acceptance of the product have been extremely gratifying. The new Unicore process is an advanced technical development in the production of foundry binder flour. Unicore was created by General Foods Research Laboratories following three years of extensive product and market research. The process permits Unicore production to be rigidly controlled and this allows foundries to select the density ranging from 425 to 600 grams per dry quart that best suits their operations. Strict control also assures uniformity in Unicore. Some foundries have discovered they can reduce the usage level of Unicore up to 20 per cent and still maintain their high-quality standards. Since Unicore is competitively priced all savings accrue directly to the foundry. Unicore is stocked in most principal markets by local foundry supply firms representing General Foods. Additional product information and free test samples can be obtained. For more information Circle No. 83 on Reader Service Card.

GREAT LAKES CARBON CORP.
18 E. 48th St., New York 17, N.Y.

Graphite is an exceptional material for many diversified industrial applications. It has a distinctive combination of chemical and physical properties; it is easily machined; it resists thermal shock; it has high thermal and electrical conductivity; at high temperatures, its strength increases and it retains dimensional stability; and it is chemically inert.

In addition to electrode application in electric steel furnaces, graphite serves many other foundry uses. The advantages of graphite over sand or other substances for permanent molds are widely recognized. The majority of cast steel railroad car wheels are produced in graphite molds. Permeability, carefully controlled, permits easy escape of gases which would otherwise cause defects.

Most non-ferrous centrifugal castings are poured into graphite molds—when the inner surface becomes worn, it is easily machined to the next larger size. Graphite dies for continuous casting of copper, aluminum, bronze and other non-ferrous metals perform efficiently and economically—Robert E. Lindemayr, product sales manager. For more information circle No. 24 on Reader Service Card.

GRINDING & POLISHING MACHINERY CORP.
2530 Winthrop Ave., Indianapolis 5, Ind.

A full line of 20 job-rated abrasive belt swing grinders are ready to serve the most specific or general production requirements. Our right combination of power and size will fit your job, whether weld removal, casting clean-up, or polishing.

Models include heavy duty units, handwheel floor snagging grinders, light weight units, medium weight grinders, as well as heavy duty and direct drive swing frame grinders and swing cut-off and buffers.—I. Werren Bosworth. For more information circle No. 37 on Reader Service Card.

HANNA FURNACE CORP.,
DIV. NATIONAL STEEL CORP.
Tecumseh Road, Ecorse 29, Mich.

Hanna Furnace Corp. provides foundries with all regular grades of pig iron, foundry, mal-

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leable, Bessemer, intermediate low-prosphorus, as well as Hannatite and Hanna Silvery. All meet the highest standards. Offices are maintained in Boston, Buffalo, Chicago, Detroit, New York, and Philadelphia. For more information circle No. 102 on Reader Service Card.

HERCULES POWDER CO.
10 Market St., Wilmington, Del.

Our Truline Binder is a dry, pulverized, thermoplastic resin used to produce cores with easy collapsibility. Resulting castings are smoother, cleaner, and sounder. For more information circle No. 48 on Reader Service Card.

HARBISON-WALKER REFRACTORIES CO.
307 Fifth Ave., Pittsburgh 22, Pa.

In the aluminum industry, new operating techniques and the development of many alloys which lead to expanding uses, have increased the severity of melting furnace conditions and have led to the development of various specialized refractories. Two new lining refractories, Coral P and Coral BP have proved themselves in actual service to be highly resistant to penetration and to reaction by molten aluminum and many alloys.

Plastic refractory centers for electric furnace roofs (Coralite Plastic Refractory and H-W Mullite Plastic Refractory) have superior resistance, which is attributable to its high refractoriness, low permeability, and outstanding resistance to thermal spalling. The plastic composition provides a degree of workability that can eliminate laminations during installation. Korundal XD is an extraordinary high-alumina refractory which has an unprecedented combination of improved physical properties and strength characteristics. Vega HP and Star Dash possesses the property of superior spalling resistance, and their use in steel foundry electric furnace roofs and in open hearth furnace roofs has resulted in greatly improved service life.—R. R. Miller, advertising manager. For more information circle No. 40 on Reader Service Card.

HEVI-DUTY ELECTRIC CO. DIV. BASIC PRODUCTS CORP.
304 Hart St., Watertown, Wis.

Whether you use fuel-fired or electric heat, automatic or batch handling, the correct combination can be supplied by Hevi-Duty. A wide and versatile selection of furnaces for both heat processing and melting offer many ways to speed production, cut maintenance and improve output—turning out uniformly high quality products day after day and year after year.

Hevi-Duty heat-treat furnaces feature "straight-through" operation—from loading through quenching. Suitable for carbonitriding, carburizing, bright hardening, annealing, normalizing and brazing, the furnaces are used for treatment of metal to 1850 degrees.

The new line of Tagliaferri Induction Receivers and melting equipment for both ferrous and non-ferrous applications, in sizes up to 30 tons, make possible greater tensile strength, improved machineability, and gentle, controlled skimming. Hevi-Duty sales engineers are capable and ready to help with any heat-processing problem, and they are backed by a company that can quickly adapt the equipment to meet your needs—E.E. Staples, president. For more information circle No. 93 on Reader Service Card.

HICKMAN, WILLIAMS & CO.
1659 Union Commerce Bldg., Cleveland, Ohio

Fast, dependable service is high on the list of plus features offered by Hickman, Williams Co. Coke, pig iron, fluxes, clay, sand, alloys, abrasives, and other products are as near as your telephone in any of 10 key foundry areas.

One major service by H-W is a coke analysis card which accompanies every car load. The analysis spells out volatile matter, fixed carbon, ash, sulfur content and the shatter test percentage for the customer.—A. J. Johnston, president. For more information circle No. 43 on Reader Service Card.

HINES FLASK CO.
3431 W. 140th St., Cleveland 15, Ohio

Magnesium is light. In recent years, foundrymen have been faced with an ever-increasing problem of reducing the weight handled by working men in the foundry. Sand handling equipment and automatic molding machines are but two developments that have helped them tackle the problem. Hines understands this problem and has been working to develop a flask that is light in weight but still has the strength for which our flasks are known.

Now foundrymen can buy Hines flasks in magnesium. These are, in most cases, as light as wood but as strong as aluminum flasks that are presently being used. The light, magnesium flasks have the same quality and design that made Hines the best known name in flask manufacturing throughout the world. The familiar "Pop-Off" mechanism, the first of its kind, is available on magnesium flasks in the same design as on aluminum flasks.

Jackets, also renowned for their quality and durability, are available in aluminum, cast iron, and aluminum-asbestos. For accurate molds, Hines jackets should be used with either Hines aluminum or magnesium flasks—David H. Hines. For more information circle No. 2 on Reader Service Card.

THE FRANK G. HOUGH CO.
Libertyville, Ill.

Spillage of bulk materials such as sand, scrap, lime, etc., during loading and transportation within plants of the metalcasting industry has been a problem for some time. Added expense is involved in keeping aisles clean and re-handling some materials. The Frank G. Hough Co. has recently developed a "no-spill" bucket for their small industrial, two-wheel-drive "Payloader" front-end loaders.

Side sheets of the buckets are curved to conform to an arc travelled by a combination strikerbar-spillguard. This device is hydraulically moved from the top side of the back of the bucket to the front. As it travels it strikes-off excess material which has been scooped into the bucket from the pile. The strikerbar remains at the front as the bucket is tripped back and lifted to carry position. During travel, it acts as a front spillguard to retain the load. At the end of the travel cycle, the device is retracted hydraulically to its original position and the load can be dumped in normal fashion. Another feature of this "no spill" device is the fact that it permits the handling of uniform loads on each trip—G. A. Gilbertson, president. For more information circle No. 67 on Reader Service Card.

HUMBLE OIL & REFINING CO.
P.O. Box 67, River Rouge Station, Detroit 18, Mich.

Not often is it possible to announce the discovery and availability of an entirely new and revolutionary product for the foundry industry. Humble Oil & Refining Co. has that pleasure in its announcement of their new product—TERMCO Carbon Sand.

Seven years of research and development have produced the first and only hard, solid, round-grain "carbon sand," providing the inert and thermally stable characteristics to be expected of carbon and the workability permitting the entire replacement of all other sands for both molding and coremaking.

Termco Carbon Sand is adaptable to all common foundry methods, including green molds, baked cores, shell, CO_2, and air-setting processes. Conventional foundry equipment and commonly used bonds and binders are workable with Termco. Reducing and cushioning additives are eliminated. Thermal expansion at elevated temperatures is approximately 1/8 that of silica sands. With little departure from ordinary foundry practices, Termco can replace silica, zircon, olevine, and various non-silica sands to eliminate or drastically reduce penetration, burn-on, scabbing, and veining of the most difficult castings of all sizes of magnesium, aluminum, bronze, gray, and malleable irons.

For castings difficult to produce without defects in ordinary silica sand, this four-sieve, AFS No. 70, round-grain carbon molding medium has become a welcome and useful tool—E. G. Gentry. For more information circle No. 62 on Reader Service Card.

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ATTENTION FOUNDRYMEN...

QUITE A FEW OF
YOUR COMPETITORS
ARE CLEANING THEIR
CASTINGS AT A
LOWER COST
THAN YOU ARE...
SIMPLY BECAUSE
THEY'VE CHANGED TO
METAL BLAST's

"SUPER-STEEL"

SHOT and/or GRIT! *

HERE'S WHY THEY CHANGED...

They're paying only $165.00 per ton (truck loads) — considerably less than you are, if you're using competitive steel abrasives. Yet, SUPER-STEEL gives them excellent cleaning, greater resistance to breakdown and lower maintenance costs. Why don't you, too, take advantage of this opportunity to cut costs? We'll rush a trial order, lab test samples, full information or have our sales engineer call.

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* 50 OR 100 lb. BAGS, PALLETIZED IF DESIRED

MANUFACTURERS, ALSO, OF TOP QUALITY "SEMI-STEEL" SHOT AND GRIT, MALLEABLE AND CHILLED SHOT AND GRIT — AT COMPARABLE SAVINGS!

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INDUSTRIAL EQUIPMENT CO.
271 Ohio St. Minster, Ohio

Our type 600-B ladle is proved by severe service in highly automated foundry operations. Specially developed for small sprue spot pouring, the 600-B combines fast, accurate pouring with economical performance. Its extreme ease of operation, precise control and exceptional pouring accuracy result in high-volume production, minimum rejects, and moderate labor costs. For more information circle No. 84 on Reader Service Card.

THE INTERNATIONAL NICKEL CO., INC.
67 Wall St., Uew York 5, N. Y.

Production of nickel-containing alloy castings provides the foundryman with a superior product which enables him to expand and capture new markets for the foundry industry. In a competitive market, a casting customer judges the foundry solely on the performance of the castings he is sold. The use of nickel in castings provides this important customer with a product offering increased service life at lower over-all cost.

Nickel is a unique alloying element which enables you to improve a wide variety of engineering properties in cast iron, steel, and austenetic cast iron; and many wear, heat and corrosion resistant castings require nickel as one of their essential alloying ingredients. To remain competitive with other industries, every progressive foundryman should investigate the benefits of nickel-containing castings.

An informative, up-to-date booklet, "A Quick Guide to the Nickel-Containing Casting Alloys," describes the many quality alloys that can be made by the modern foundry for modern industry. Free copies are available—Robert Savage, foundry industry manager. For more information circle No. 5 on Reader Service Card.

CHARLES C. KAWIN CO.
431 S. Dearborn St., Chicago 5, Ill.

For many years this company has served the foundry industry in consulting and service capacities. One of the pioneers in the introduction of chemical analysis in the gray iron foundry industry, the laboratory has been an important contributor to the development of controls in the entire field of metallurgy.

Services include chemical and spectrographic analysis, physical testing, metallurgical and foundry consulting—Charles C. Kawin. For more information circle No. 31 on Reader Service Card.

KEOKUK ELECTRO-METALS CO., DIV. VANADIUM CORP. OF AMERICA.
320 Concert St., Keokuk, Iowa

Kemco Silvery pig iron, a form of silicon introduction, produced by Keokuk Electro-Metals Co., is available in 60 and 30 lb pigs and 12-1/2 lb piglets, in regular analysis or alloyed with other elements. The product can be handled by magnet or charged by weight or count. Kemco provides a consistant, uniform melt. For more information circle No. 88 on Reader Service Card.

LESTER B. KNIGHT & ASSOCIATES, INC
549 W. Randolph St., Chicago 6, Ill.

Lester B. Knight & Associates, Inc., management consultants and industrial and plant engineers, has unusual experience in the foundry field. The Knight organization has completed several hundred successful assignments in every type of foundry, gray iron, steel, malleable, brass and bronze, magnesium, and aluminum. These foundries are producing castings from a few ounces to 50 tons and from 1 to more than 1500 tons of castings per day. Green sand, dry sand, cement, plaster, shell molds, permanent mold, centrifugal, die casting and investment casting operations all have been served by Knight.

Working closely with clients' staffs, Knight engineers have assisted its clients to audit operations, define management functions, establish organization, modernize methods, mechanize and automate facilities, and design complete new plants. They have successfully assisted management to establish more economical procedures for the control of operations and costs. For more information circle No. 40 on Reader Service Card.

KOPPERS CO., INC.
Kearney, N. J.

Koppers Premium Foundry Coke offers uniformity in size, strength, structure and chemical analysis—day after day. Foundries using this coke find they can maintain higher temperatures which increases the cleanliness of the iron, reduces fuel consumption and results in lower operating costs.

The reason—Koppers Coke is prepared from the highest quality West Virginia coals, carefully blended and baked exactly the right length of time—Paul McConnaughey. For more information circle No. 88 on Reader Service Card.

D. C. LATELLA & ASSOCIATES, INC.
624 Widener Bldg., Philadelphia 7, Pa.

D. C. Latella & Associates, consulting engineers, offers professional foundry engineering in organization, management controls, survey of facilities, plant layouts, modernization, mechanization, industrial engineering, wage incentive, methods and procedures, production and control, and cost systems. For more information circle No. 103 on Reader Service Card.

LECTROMELT FURNACE DIV., MCGRAW EDISON CO.
P.O. Box 1257, Pittsburgh 30, Pa.

Lectromelt electric arc-furnaces are available in types and sizes to meet all requirements—for melting all grades of steel, gray iron, malleable iron, copper, etc. Sizes range from 200 lb to 200 tons. Fast top charging, accurate controls, and rapid melting cycles result in high availability with maximum output and product uniformity. Features include separately mounted lift-and-swing roof mechanism, and in larger sizes, platform-mounted shell construction. Electrode holders are power-operated. Tapered, diamond-shaped electrode arms are efficiently water cooled.

In cooperation with the Pennsylvania Transformer Div., McGraw-Edison Co., the Lectromelt Furunace Div. offers furnace transformers with an unsurpassed record for reliability. Since the introduction of a special type of helical winding more than 25 years ago, there has never been a low-voltage winding breakdown on any Pennsylvania furnace using this design. A new coordinated tap changer and control system permit transformer taps to be changed in seconds.—C. V. Walker, assistant sales manager. For more information, circle No. 80, on Reader Service Card.

LINDBERG ENGINEERING CO.
2450 W. Hubbard St., Chicago 16, Ill.

Four new items are proving to be of considerable value to the aluminum casting industry. The Lindberg-Fisher Vacuum Autoladle is a new design of the popular Autoladle. Very accurate shots are made with a timed pressure cycle, and vacuum is used to refill. There are no moving parts in this all-refractory unit.

A new feature on the Lindberg-Fisher Two-Chamber Induction Furnace is the replaceable inductor section. This enables quick interchange with a spare inductor section for minimum non-productive time and minimum relining cost. Considerable interest in the low-pressure permanent molding process has resulted in increased applications for the Lindberg-Fisher Pressure Electric Resistance Crucible Furnace for this method.

The Lindberg-Fisher Radiant Wall Gas-Fired Crucible or Pot Furnace for melting or holding offers the advantages of cool surroundings, fast start-up, and better crucible or pot life—Ray P. Dunn, technical director. For more information circle No. 1 on Reader Service Card.

LOUTHAN MFG. CO., DIV. FERRO CORP.
4150 E. 56th St., Cleveland 5, Ohio

The Louthan plant of the Ferro Refractories Div. has developed a complete line of runner tile, breaker cores for necking down risers, and strainer cores which have been proven throughout the foundry industry. In every case, Louthan foundry refractories are manufactured from compositions specifically designed for special applications.

Castings up to 40,000 lb have been poured through Louthan runner tile without runout, oxidation, erosion, spalling or out-gassing. This precision-made ceramic runner tile has gained considerable popularity throughout the industry as an effective cost reducing product at economical prices. Louthan refractory breaker cores are designed to neck-down the riser area and reduce surface grinding and chipping to a minimum. Made from a specially designed aluminum silicate composition, these breaker cores have good heat holding qualities, thereby affording a smooth clean surface where exposed to the metal. Louthan strainer cores have been used throughout the metalcasting industry for more than a decade. Sand inclusions and other metal contaminants are eliminated through the use of these ceramic cores. More effective control of the metal pour makes for less reject castings, and this can be obtained at prices which are less than the cost of producing sand cores.—Fred A. Layne, works manager. For more information circle No. 104 on Reader Service Card.

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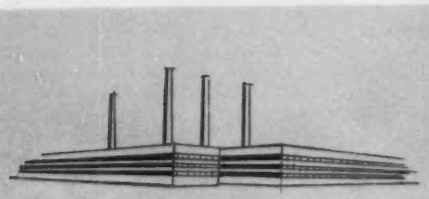

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MAGNET COVE BARIUM
P.O. Box 6504, Houston 5, Tex.

Magnet Cove or "Magcobar", as it is popularly known, offers the casting industry a complete bentonite service from product development to final casting quality.

Its Research and Development Center, located at Arlington Heights, Ill., was constructed in order that Magcobar could expand its assistance to the castings industry. It serves industry in three ways:

1. Development of basic information to help in the better utilization of techniques and materials in all phases of the castings operation. With the center's pilot foundry, Magcobar sand engineers can duplicate the entire casting operation and study sand properties, bonding materials, and mixing techniques. All information is made available to the industry at no cost.

2. Continuous improvement of Magcobar products. For maximum performance, MCB offers a complete line of foundry bentonite, including Yellowstone, a western bentonite; Auto-bond, a low viscosity bentonite; and Southern Star, a southern bentonite.

3. Development of new products and new techniques by careful study of foundry requirements. The Magcobar facilities are available to the industry for the reproduction and study of specific production problems. Write for the free booklet "Progress is the Fruit of Research"—Gerry Morrical, manager, foundry division. For more information circle No. 55 on Reader Service Card.

MARKAL COMPANY
3052 W. Carroll Ave., Chicago 12, Ill.

"Thermomelt" is the name of a new product line developed for the metalworking industry by the Markal Co. It is a precision temperature indicator designed to tell the metallurgist, engineer, or metalworker when a surface has reached a specific temperature.

Available in stick, pellet, and liquid form, "Thermomelt" is provided in a wide range of Fahrenheit ratings from 113 to 2,000 degrees. In application, the metal surface is marked with the stick or liquid or a pellet is placed on the surface. When the surface reaches the wanted temperature, the mark or pellet quickly liquifies.

The stick comes in a metal holder which enables the user to dispense it as needed. The liquid is packaged in a bottle with a brush dispenser, and the pellets are packaged 20 to a plastic tube—Miss Eva Cooper. For more information circle No. 21 on Reader Service Card.

L. H. MARSHALL CO.
270 W. Lane Ave., Columbus 2, Ohio

Progressive non-ferrous foundries recognize that casting quality depends on the amount of care exercised in measuring and controlling metal temperatures. To achieve optimum product quality, thousands of foundries have standardized on Marshall enclosed-tip thermocouples. These fast, dependable instruments accurately and economically determined exactly when to pour melts of brass, bronze (except phosphor-bronze), aluminum, and magnesium, and other non-ferrous metals poured below 2300F.

When readings are taken frequently and regularly with Marshall thermocouples, an upgrading in casting quality is noticed immediately. Scrap rejects, misruns, and coldshuts are minimized. Shrinkage porosity, gas porosity, and dross are drastically reduced. Casting finish improves, and grain size is consistently stronger, denser, and more uniform, but foundry production increases and unit cost decreases as the scrap pile dwindles. Temperatures are reported accurately from the interior of the melt, not from the surface.—John H. Brown, engineer. For more information circle No. 77 on Reader Service Card.

METAL BLAST, INC.
872 E. 67th St., Cleveland 3, Ohio

Many foundries using steel abrasives have been able to reduce their blast-cleaning costs through the use of "SUPER-STEEL" shot and/or grit. About a year ago, Metal Blast, Inc. began producing this new steel abrasive, using an entirely new process that proved to be much more economical than the conventional process used by others. Savings in production costs have been passed along to consumers, resulting in a cost-per-ton considerably under prevailing prices.

The new process turns out high quality steel shot and grit with a maximum carbon content of 1.5 per cent. It may be used for cleaning all types of castings, including brass and aluminum. The resulting finish is always bright and shiny—with no discoloration or metal residue. Cleaning efficiency, resistance to breakdown and effect on blasting equipment compare very favorably with higher priced steel abrasives—Nelson A. Libman, president. For more information circle No. 12 on Reader Service Card.

METAL & THERMIT CORP.
Rahway, N. J.

Metal & Thermit Corp. now offers an expanded service on zircon through its sources of high quality zircon in both the United States and Australia for the production of granular, dry-milled, and wet-milled zirconium silicates. This expansion in zircon and the recent construction of a high temperature research center are part of a continuing program to provide dependable supplies of high-performance zircon materials to foundries. For more information circle No. 105 on Reader Service Card.

MODERN EQUIPMENT CO.
260 S. Spring St., Port Washington, Wisc.

Modern produces standard and water-cooled cupolas which do the melting chores for many of the nation's foundries. We also manufacture cranes, trolleys, and monorail systems which are engineered to the specific needs of the customer.

Working together with foundrymen, Modern designed and developed the one-man pouring device we now offer. Our line of ladles includes all types and sizes—engineered to metal loads and pouring conditions.

A recent installation of two water-cooled cupolas, equipped with 1000 F. recirculatory heaters, consolidated the work of three former separate melting areas into one automated center for charging and melting supervision. Labor is minimized by two skip chargers—complete with small-cone, orange-peel buckets, coke bins, and flux bins. This is only one of many Modern installations which aid foundrymen in the search for more profitable operations—H. W. Schwengel. For more information circle No. 89 on Reader Service Card.

MOLYBDENUM CORPORATION OF AMERICA
1312, Bldg. No. 4, Gateway Center, Pittsburgh, Pa.

Molybdenum is the workhorse of the metals industry—it improves corrosion resistance, reduces temper brittleness, raises hardenability, enhances shock resistance, and increases tensile properties when added to steel. For more information circle No. 35 on Reader Service Card.

NATIONAL ACME CO., SHALCO DIV.
170 E. 131st St., Cleveland 8, Ohio

National Acme Co. has announced development of a new, semi-automatic Shalco shell core blower, model U-180-M. Many automatic features including power roll-over are provided and only a few manual operations such as core box opening and closing are required in a cycle. Each step in sequence is automatically controlled by pre-set timers to insure consistent quality of shell core production.

This compact unit has all the basic features and versatility of its fully automatic counterpart, Model U-180, but at considerably less cost. Occupying an area only 8x8 feet, the machine is offered for either gas or electric core box heating, and accommodates core boxes up to 20x27 inches with a maximum depth of 15 inches. The integral sand hopper will hold 150 pounds of sand. One man can operate more than one machine; for this purpose right and left hand models are available.—Shalco Div., manager. For more information circle No. 54 on Reader Service Card.

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NATIONAL CARBON CO., DIV. UNION CARBIDE CORP.
270 Park Ave., New York 17, N. Y.

Wherever hot metal is handled, in the cupola, or in numerous other metal processing applications, carbon and graphite excel. They are non-melting and non-softening at high temperatures, resist severe thermal shock, do not stick to most castings, billets or ingots, and are non-reactive with most molten metals and metal-producing slag.

They exhibit a high strength-to weight ratio, a very low thermal expansion, and present no problems of warping, spalling, or contamination. Graphite has high thermal conductivity and it increases in strength as temperature increases. Carbon excels in resistance to abrasion and erosion. Carbon refractories are available in large blocks, standard brick shapes, ramming paste, and carbonaceous cements. Graphite in the form of such accessories as fluxing and injection tubes, skimmer floats, crucibles, molds and dies, plunger bells and sleeves, mold cores, core rods, chill rods, and ladles provide convenience and economy in foundry operations. For further information circle No. 53 on Reader Service Card.

NATIONAL ENGINEERING CO.
155 N. Wacker Dr., Chicago 6, Ill.

Today the urge is toward more mechanization. Automation is the key to progressively lower cost and higher quality castings. The need for continuous sand control has become essential to satisfy the high production molding lines being installed in foundries across the country. Newer molding machines promise even greater improvement in production. National Engineering has geared their newest Simpson muller line to fit the need of linking sand preperation systems to high volume lines. The requirement is simply expressed: A greater volume of more tightly controlled sand at lower cost of preparation.

The Simpson Multi-Mull is designed to meet these requirements through:

1. Reduction in overall equipment components and capital outlay.
2. Subsquent simplification of automated systems and reduction in maintenance costs.
3. More sand per foot of floor space used and man hour expended.
4. Tighter moisture control.
5. Consistent moldability with fewer tests and corrections to establish and keep control.

—E. C. Troy, vice-president. For more information circle No. 71 on Reader Service Card.

NATIONAL METAL ABRASIVE CO.
3560 Norton Ave., Cleveland, Ohio

The metalcasting industry has seen a number of improvements in metal cleaning techniques in the past few years, but few changes in shot and grit as dramatic as product improvements released by National Metal Abrasives during 1961. New Controlled T, a low phosphorus ductile matrix abrasive, was reformulated to produce 40 per cent greater life than the controlled toughness material formerly marketed. With a Rockwell C rating of 50-60, plus a low phosphorus content for durability, the abrasive delivers greater usable life at no increase in cost or decrease in machinery life.

Well over 6000 tons of Controlled T were tested in some 500 foundries and laboratories prior to official release of the newly improved product. In effect, the improvement amounts to a 40 per cent price reduction. A second major change was in National's pearlitic malleable shot or grit, called High Hardness Permabrasive. By reducing graphitic carbon to less than 0.03 per cent of total content, the company is able to increase cleaning action by 15 per cent without decreasing abrasive life. For more information circle No. 51 on Reader Service Card.

THE OHIO ELECTRIC MFG. CO., SUBSIDIARY OF HOWELL ELECTRIC MOTORS CO.
5400 Dunham Heights, Ohio

Our products, consisting of magnetic materials handling equipment (specifically lifting magnets) and magnetic separation equipment (specifically electro suspended separation magnets on permanent magnetic equipment) is highly beneficial to the modern, well-equipped foundry.

The separation equipment protects expensive machinery from damage, cleans sand of extraneous ferrous material, and, as an all-around helper, does "mop-up" work in a ferrous foundry.

Lifting magnets can be used extensively to handle material that is ordinarily very difficult to maneuver. The foundry can use lifting magnets for handling metal and castings in the melting, cleaning and heat-treating departments. Of course, magnets are generally in use today for handling scrap, both inside and outside of the foundry, but the modern foundryman is realizing the exciting potential of using lifting magnets in actual operations. No matter what your lifting problem—Ohio magnets do it better, faster and at a lower per-ton cost.—Edward Richard, magnet sales. For more information circle No. 63 on Reader Service Card.

OHIO FERRO-ALLOYS CORP.
839 W. 30th St., N.W., Canton, Ohio

A complete line of ferro-alloys is provided for iron, steel, malleable, and ductile iron foundries. We are proud of our quality control and fast service from any of our general warehouses or our distributors' warehouses located throughout the country.

Each alloy briquette for the iron foundry has a distinct shape and color. Errors in adding silicon, manganese or chromium to the charge can be avoided.

Ohio Ferro-Alloy's calcium-silicon and calcium-manganese-silicon are widely used as deoxidizers and degassifiers for cast steel. These are particularly helpful in avoiding undesirable inclusions. Steel foundries have reported improved ductility and fluidity when these calcium alloys are used.

We offer a free consultation service to assist in the selection of the proper alloy to suit your specific application. This is a feature of our Foundry Service Department—D. Matter. For more information circle No. 45 on Reader Service Card.

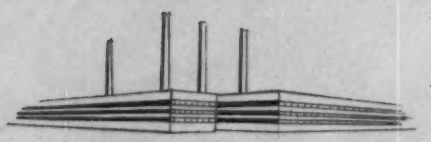
OLIN MATHIESON CHEMICAL CORP.
400 Park Ave., New York 22, N.Y.

Olin's foundry ingot made from high purity primary metal provides the foundryman with many advantages he cannot obtain in any other way. One main advantage is its superior resistance to corrosion as compared to other foundry materials. This advantage can be obtained only when the heavy metal content in the alloy is at a low level. Foundry characteristics of the alloys depend to a very considerable extent on the content of the impurities. With the substantial absence of these impurities, foundry characteristics are generally superior, and above all, more consistent which provides foundrymen with another safety factor. Many impurities also have an adverse effect on the engineering properties of the casting. This necessitates their very close control to reach most of the maximum properties attainable with the alloy. It is axiomatic that high quality foundry products can be made only from the highest quality materials. Derek Richardson, vice-president, Metals Div. For more information circle No. 52 on Reader Service Card.

PANGBORN CORP.
Hagerstown, Md.

With foundrymen more than ever seeking ways to cut costs, the use of a single machine for both core knockout and blast cleaning is fast becoming a major objective in modern cleaning rooms. For more than three years a well-known Pennsylvania steel foundry has been using a standard heavy-duty Pangborn Rotoblast Barrel for this dual purpose finishing with very substantial economic and production speed gains. The barrel, with no abrasive-system equipment added, simultaneously cleans and removes more than 1000 pounds of core sand from loads in excess of 5000 pounds of green sand castings in eight-min. cycles.

Pangborn engineers solved the special abrasive separation problem with a new multiple-section airwash separator that can be used singly in small capacity barrels or in multi-



ple side-by-side sections for larger units. Since there is no by-pass circuit, only one elevator is required. This new separator eliminates need for tumbling work in barrel prior to abrasive blasting. Dual performance cleans work faster and cleaning costs are greatly reduced.—A. L. Gardner, advertising manager. For more information circle No. 70 on Reader Service Card.

PASADENA HYDRAULICS INC.
1433 Lidcombe St., El Monte, Calif.

Here's a four-minute gray iron quality control test for foundrymen. Low-cost bench type tester yields accurate technical data on strength and ductility as soon as test bar has cooled. For more information circle No. 49 on Reader Service Card.

PENNSYLVANIA GLASS SAND CORP.
375 Park Ave., New York, N. Y.

Pennsylvania Glass Sand Corp. offers 35 grades of foundry sand. It can supply grades of shell molding sand, core and molding sand, semibonded sand, and silica gravel. Foundrymen can select the grade and type of sand just right for their casting requirements from the company's expanded line of foundry sands. Or, Pennsylvania Glass Sand can blend special grades of its new core and molding sands to meet exact specifications. The company also offers a complete range of grades of Supersil silica flour. Offices are located in New York, Pittsburgh, St. Louis, and Dallas. For more information circle No. 72 on Reader Service Card.

PERMANENT MACHINE DIV.
PERMANENT MOLD DIE CO.
2275 E. 9 Mile Rd., Warren, Mich.

PMD offers you the finest quality low pressure die casting machines available. These machines assure close tolerances and reduced trimming operations. Mold is placed above a pressurized, airtight furnace; molten metal is then forced through a tube into the mold from below. Pressure is held just long enough for metal in mold cavity to solidify, then released so excess metal can flow back into the molten bath. Gating system can be simplified and risers reduced to a minimum. Result is a greatly increased casting yield. Circle No. 33 for more detailed information about PMD automated casting machines.

PHILADELPHIA QUARTZ CO.
1156 Public Ledger Bldg., Philadelphia 6, Pa.

The sodium-silicate carbonate dioxide method of bonding sand first appeared on this continent about six years ago after previous development in Europe. Its advantages of fast set and freedom from gaseous decomposition under heat has a wide appeal and has resulted in adoption for many types of commercial foundry production.

An alkaline sodium silicate usually is required as the binder. When the granules are thoroughly wet and plastic, the mixture is molded around a pattern and then carbon dioxide is blown in for a few seconds so that it permeates the entire sand mass. The gas neutralizes the silicate alkali and precipitates silica in a gelatinous form that solidifies almost instantly.

To make the sand break free from the casting, a small amount of sugar, coal dust, asphalt or other carbonaceous material is blended with the silicate. Under the heat of the molten metal, the organic matter burns out leaving areas through which hot gases escape. The resultant core is thus made friable for easy removal from the finished casting. There are many variations of the process to meet special conditions.

Philadelphia Quartz has over a century of experience in silicate manufacture and uses, with a wide range of silicate products for your choice.—F. M. Suarez. For more information circle No. 65 on Reader Service Card.

PICKANDS MATHER & CO.
332 S. Michigan Ave.
Chicago 4, Ill.

The most important step in increasing the use of iron castings is to improve their quality and uniformity. The one sure road to quality is control, and control can only be achieved through efficient melting practice and the use of quality raw materials.

Because of its purity (i.e., lack of contaminants), pig iron is the essential melting stock in the production of quality castings. Meltrite pig iron and Globe silvery in all analysis ranges are produced from our own ores and coals selected to be as free as possible from all incidental elements. Meltrite and Globe, when used as the major ingredients in a controlled cupola charge—pig iron, steel, and the foundryman's own remelt—results in close control of analysis. This permits the meeting of today's rigid specifications and is one sure road to increased business—John H. Bemis, manager pig iron and coke sales. For more informaton circle No. 18 on Reader Service Card.

PITTSBURGH COKE & CHEMICAL CO.
Grant Bldg., Pittsburgh, Pa.

Our Neville Foundry Coke is strong, dense, and uniform. Controlled through every step of production, it has more fixed carbon, less ash and sulphur content. With this coke foundrymen can produce better, cleaner, more fluid iron—the type required to produce a wide variety of fine gray iron castings. For more information circle No. 43 on Reader Service Card.

THE PYROMETER INSTRUMENT CO.
Bergenfield, N. J.

An accurate and reliable Surface Pyrometer is of utmost importance to the foundryman doing production or experimental work in the shell molding process. The new PYRO surface pyrometer is a portable, accurate, rugged, and dependable instrument featuring the largest direct reading scale (4-3/4-inch indicator) of any unit of its type.

It is constructed in a dust, moisture, and shock-resistant shielded steel housing which makes it not only rugged and durable, but also immune to external electrical influences. The automatic internal cold end junction assures accurate and true temperature readings at all times and under all conditions.

The exclusive Pyro Lock-Swivel on the extension arms permits the thermocouple to be locked in any position or angle, and it cannot be jarred loose while the instrument is in use.

Pyro offers a wide selection of thermocouples and extension arms, all interchangeable without adjustment or recalibration. This makes it possible to solve practically any surface or sub-surface temperature measuring problem with one unit. Available in five standard temperature ranges to meet plant and lab requirements—Russell C. Ayers. For more information circle No. 20 on Reader Service Card.

REICHHOLD CHEMICALS, INC.
RCI Building, White Plains, N.Y.

New from Reichhold Chemicals is FOUNDREZ ESL-1485 Auto-Bake core binder, a self-curing core binder based on furfurylated amino-aldehyde. Intended for core room applications in which it is desireable to "set" the sand mix before core removal. Heat can be introduced for extremely fast preliminary cure. In either room temperature or heat curing, Foundrez ESL-1485 requires the addition of Foundrez 1485-C Catalyst.

Reichhold also supplies a complete range of liquid resin, oil, granulated and powdered resin, oil and powdered accelerator binders, as well as sand conditioning and sand coating agents for conventional cores, shell molds and cores, self-curing, and sand coating processes. These products are customized to fit the particular needs of each foundry—O. Jay Myers. For more information circle No. 8 on Reader Service Card.

ROURA IRON WORKS, INC.
1414 Woodland Ave., Detroit, Mich.

Roura's self-dumping hopper fits any lift truck, dumps automatically, and can cut handling costs 50 per cent! With this self-dumping hopper on your lift truck, one man can do the work of two—in a fraction of the usual time. It's the modern, low-cost way to handle scrap metal, small castings, and sand.

See Suppliers' Directory on Page 139

Attaches in seconds to any lift truck-fork or platform. Hopper automatically dumps its load, rights itself, and locks. For more information circle No. 37 on Reader Service Card.

ROYER FOUNDRY & MACHINE CO.
155 Pringle St., Kingston, Pa.

Sand separators and blendors use a unique "combing belt" principle (we call Royeration) that combines combing of the sand with thorough churning, mixing and cooling. These machines, for any size foundry, are available both as portable or stationary models, as hand-shovel, tractor-bucket feeding, or mechanized in-line installations. Capacities range from 4 to 180 tons per hour.

Royer has been serving the foundry industry for some 40 years—offering the best in blended and aerated sand. Specifications and facts will be yours if you contact us or send for New bulletin No. SS-60.—For more information circle No. 47 on Reader Service Card.

ALEXANDER SAUNDERS & CO., INC.
95 Bedford St., New York 14, N.Y.

Investment casting, heretofore confined to specialty custom casting firms and captive foundries, may now be considered by the general foundry to meet today's demand for greater precision, improved surface finish, and more intricate design. The newly developed shell investment casting system permits making larger castings—up to 100 lbs of steel—with the same degree of precision expected for lost wax castings weighing less than 1 lb each.

The process stages include: (1) Pattern production and wax pattern assembly for investing; (2) Building the refractory shell by dipping the wax pattern assembly in a refractory slurry, stuccoing and drying. This operation is repeated to build up the mold to sufficient strength; and (3) Firing the mold to remove the wax and to develop its refractory properties.

The general foundry, equipped with adequate melting capacity, can add shell investment to their operations very easily. Essential equipment includes wax injection presses, slurry mixing equipment, stuccoing equipment, and high temperature mold firing furnace.

The cost of this equipment, compared to modern equipment for high production sand casting, is surprisingly low while the value of the product is substantially higher. Details on equipment, operating supplies and techniques is available—Alexander Saunders, president. For more information circle No. 11 on Reader Service Card.

SCIENTIFIC CAST PRODUCTS CORP.
1390 E. 40th St., Cleveland 3, Ohio

Each scientific pressure cast aluminum matchplate is inspected at seven points of manufacture to assure highest matchplate quality. The patented new Fortschneider Shift Indicator is now employed exclusively by Scientific to gain still greater control on matchplate quality.

For 23 years, Scientific Cast Products Corp. has pioneered and advanced the use of pressure casting in plastic molds. A great number of problems in the industry have been encountered, analyzed, and solved in a most precise and economical way.

We invite you to send prints, samples, and specifications for quotation, and we are always happy to assist on technical questions—W. Hale and W. Hilberer. For more information circle No. 15 on Reader Service Card.

SIMPLICITY ENGINEERING CO.
Durand, Mich.

Simplicity conveyors have proved efficient for transferring materials, such as sand and castings, from one point to another. Feed points can be positioned along the length of the conveyor and materials transferred to a common discharge point. "VS" conveyors are available in widths from 12 to 36 inches and in lengths from 10 to 60 feet with one drive assembly. At customer request these conveyors can be equipped with liners, covers, or can be built in two surface units. For more information circle No. 36 on Reader Service Card.

SPEER CARBON CO., CARBON PRODUCTS DIV.
Theresia St., St. Mary's, Penna.

Speer's new "Kostkutter" rods, carbon cutting rods—designed to save you 20 to 25 per cent over conventional cutting carbons—feature a revoluntionary new design. This design permits new rods to be joined to stubs . . . virtually eliminating former waste.

At the same time torch life is prolonged since the hot spot can be kept a safe distance from the clamping device. Kostkutter rods are copper-plated (except tapered sections) after shaping rod ends. This insures perfect contact between rods. The rods are available in diameters of 1/2-inch to 1-inch. The company also has standard cutting carbons at slightly lower prices.—George J. Fehrenbach, president. For more information circle No. 48 on Reader Service Card.

STAHL SPECIALTY CO.
Kingsville, Mo.

Stahl's operating equipment brings automation to the permanent mold casting field. The Standard Dual Power Unit may be used to operate two machines at the same time on the same or separate cycles. Machines feature rails for quick mounting and dismounting of molds. Normal time for changing molds should not exceed 10 minutes. Machines are made in various sizes and capacities to cover the range of jobs for most shops.

Through the use of Standard Dual Power Unit and the new Self-Pouring Machine, metal is poured automatically. The machine pours large castings from two dozen gates with only one operator. Each casting is exactly alike, yet pour can be adjusted to any rate. This equipment also eliminates turbulence through simple gating, since metal flows down a gentle slope. All units are equipped with quick disconnect hydraulic hoses for fast set-up and interchangeability between machines. Timer controls cooling interval so that the mold opens and ejects automatically. Power unit also includes counter.—G. W. Stahl. For more information circle No. 82 on Reader Service Card.

STERLING NATIONAL INDUSTRIES, INC.
Milwaukee 14, Wis.

With the shift in emphasis from increasing capacity to increasing efficiency, the foundry has adopted automation as its natural recourse. To aid in decreasing man hours per ton Sterling has taken an active part in designing flask equipment that works more efficiently with the new highly automated molding machines and handling equipment. Heavier flanges and thicker walls help compensate for greater molding pressures. Precision machining of parting surfaces, roll-off flanges and indexing points improves not only the physical characteristics of the finished casting, but allows an accurate flow of the mold through its cycle. We feel that the industry is rapidly approaching the second, or push button, stage of automated mold production and have appropriately equipped our plant with manufacturing facilities to meet the new end exacting demands as they occur.

A new loose cornered flask called the Slip-Ster has been developed. It is unique in that it materially reduces the effort required to operate the closing handles. The new self-adjusting Ster-LINKed pouring jackets have been widely accepted as have the new expanded metal bottom boards.—Howard Volt, vice-president, sales. For more information circle No. 78 Reader Service Card.

FREDERIC S. STEVENS, INC.
1800 18th St., Detroit, Mich.

Stevens handles a complete line of core and mold washes, liquid parting, core pastes, binders, muddling compounds, and sand conditioners designed to produce better, cleaner castings and reduce overall foundry costs. For more information circle No. 41 on Reader Service Card.

SUPERFLUX MFG. CO.
16125 Cleophus Pkwy., Allen Park, Mich.

Superflux briquetted cupola flux pays for itself many times over by making a thinner

more active slag. Tuyeres and slag holes don't clog and resulting iron is cleaner with more uniform analysis. For more information circle No. 39 on Reader Service Card.

SYNTRON COMPANY
Homer City, Pa.

Syntron Co. has introduced a new concept in the art of parts finishing with the development of vibratory Barrel Tumbling Machines featuring electromagnetic vibratory drives for deburring, cleaning, descaling, or most any parts finishing job.

Powerful, controlled directional vibration keeps both parts and media agitated and constantly working 100 per cent of the time. This constant vibration assures more thorough working of hard-to-get-at places and shielded areas. The amplitude of vibration can be instantly varied, while the same frequency of 3600 vibrations per minute is maintained. A turn of the rheostat knob on the control box is all that is required to change the amplitude. The result of using a Syntron Barrel Tumbling Machine is faster, more economical parts finishing for the foundryman.—L. R. Morgan. For more information circle No. 64 on Reader Service Card.

THE CHARLES TAYLOR SONS CO.
710 Burns St., Cincinnati, Ohio

Throughout the years the Charles Taylor Sons Co. has specialized in the manufacture of high temperature refractories for severe service conditions beyond the range of ordinary materials. Because of their specialized nature, consultation with a Chas. Taylor Sons refractory engineer is encouraged, especially if the job at hand presents a difficult refractory problem.

Reduction in cost per pound of metal melted as well as improvement in quality of end product can be expected with the small additional investment made in higher-purity, longer-lasting Taylor Refractories. A specific example of this is the use of TAYCOR 414 Hydrocast in ladle linings. Iron and steel foundries in ever increasing numbers report more economical service and higher quality castings.

The Charles Taylor Sons Co. can recommend a cost-saving special refractory for many of the multiple foundry applications or problems you face today—G. B. Schulte, manager of sales and services. For more information circle No. 61 on Reader Service Card.

UNION CARBIDE METALS CO.
DIV. OF UNION CARBIDE CORP.
270 Park Ave., New York 17, N.Y.

Polls of gray iron castings users have indicated that they rate machinability as extremely important. Foundrymen are improving the machinability of their castings by inoculating in the ladle with Union Carbide Metal Company's "SMZ" alloy. This strong graphitizing inoculant eliminates chilled corners and edges that cause excessive tool wear and breakage in the machine shop. As much as 25 per cent faster machining rates have been reported. Only 2 to 4 lbs of "SMZ" alloy per ton generally eliminate chill.

In recent years, the use of charge chrome in stainless steel melting has increased markedly because it is the lowest cost ferrochrome available. Union Carbide offers two alloys with different chromium, carbon, and silicon contents to meet individual practices. UCM's studies, using a high-speed electronic computer, have helped steelmakers select the charge chrome that will give the lowest costs—F. E. Loeffler. For more information circle No. 25 on Reader Service Card.

UNIVERSAL CLAY PRODUCTS CO.
1505 First St., Sandusky, Ohio

Refractory gating components, featuring thin-wall construction, provide as much as 35 per cent lighter weight. These components will not spall or erode in use, even at temperatures up to 3250 F. They are also designed to eliminate slag inclusions, stop rejects, and reduce cleaning time.

Quality products offered to foundries include pouring tubes (matched ends and plain ends), bent tubes, elbows, tees, pouring basins, strainer cores (round or rectangular), and splash cores.—For more information circle No. 90 on Reader Service Card.

VANADIUM CORP. OF AMERICA
420 Lexington Ave., New York 17.

Vanadium Corp. of America through a coordinated program of research and technical field representatives has developed during more than 50 years service to the foundry industry, a complete line of standard and special alloys adapted to industry needs. New and older products are continually tested at the Research Center and Pilot Plant, Cambridge, Ohio, and in actual field trials in customers' production facilities.

Vanadium's full line of high and low carbon ferrochromium alloys permit application of the best alloy for each job at the lowest unit cost. New alloys for improved efficiency and lowest cost are continually under development. Silicon alloys covering the complete range from silvery pig iron (with or without additional alloys) to silicon metal make proper and economic selection possible. Briquettes of silicon, chromium, manganese and silicon-manganese alloys have recently been improved for better performance with less breakage loss. Five types of exothermic alloys are useful for both steel and iron applications. Various types of ferrovanadium and vanadium metal are also available.

For more information circle No. 68, on Reader Service Card.

VITRO CHEMICAL CO., SUBSIDIARY OF
Vitro Corp. of America.

Vitro Chemical Co. produces rare earth metals, chemicals, and alloys. The Chattanooga unit of this division is the first United States production facility designed to use a caustic soda attack on monazite—a method with important processing advantages for rare earth separation.

Vitro presently produces thorium-magnesium master alloy, an alloy available to the magnesium industry in 20, 30, and 40% thorium-contained amounts. In addition, Vitro research is presently working on a didymium-magnesium master alloy, as well as other master alloys that will provide improved heat and physical properties to ferrous and nonferrous metals. A major portion of the Chattanooga effort in the future will be oriented toward new product and process development in the metallurgical field. Vitro Chemical is the newest division of Vitro Corporation of America.—R. E. Levitan, market research manager. For more information circle No. 75 on Reader Service Card.

WAIMET ALLOYS CO.
5320 Oakman Blvd., Dearborn, Mich.

If you are casting stainless steel, tool steel, or superalloys be sure to use Rx MET alloys —certified for exact chemistry and heat treat response. For your free copy of "Heat Treatment and Properties of Cast Hardenable Stainless Steels" circle No. 38 on Reader Service Card.

WALKER PEENIMPAC MACHINE MFG. DIV.
WALKER PUMP CO.
546 11th St., Brooklyn 15, N.Y.

The Walker Peenimpac Machine for airless blast cleaning and peening does a large variety of jobs in the foundry and is by far the most economical for batch work on all metals. Aluminum, zinc, copper, and brass as well as other non-ferrous metals are processed inexpensively and efficiently in the Walker units, producing a beautiful finish in three or four minutes—using Walker Peenimpac steel shot and grit.

Using the patented "impact" rather than centrifugal means of blasting the work, the equipment is designed for the greatest savings. This is not limited to the initial cost, but to very low operating and maintenance costs as well. Two, three, or several machines, each set up to do a particular item or job, operate at peak efficiency and economy by using the "just right" blasting medium with the "just right" machine variables. The equipment is compact, but its pay load is high.

Sizes range from three cubic feet to 24 cubic feet. The machines, complete with electrical equipment, arrive assembled and ready to go to work within a matter of a few hours—Leon Walker. For more information circle No. 6 on Reader Service Card.

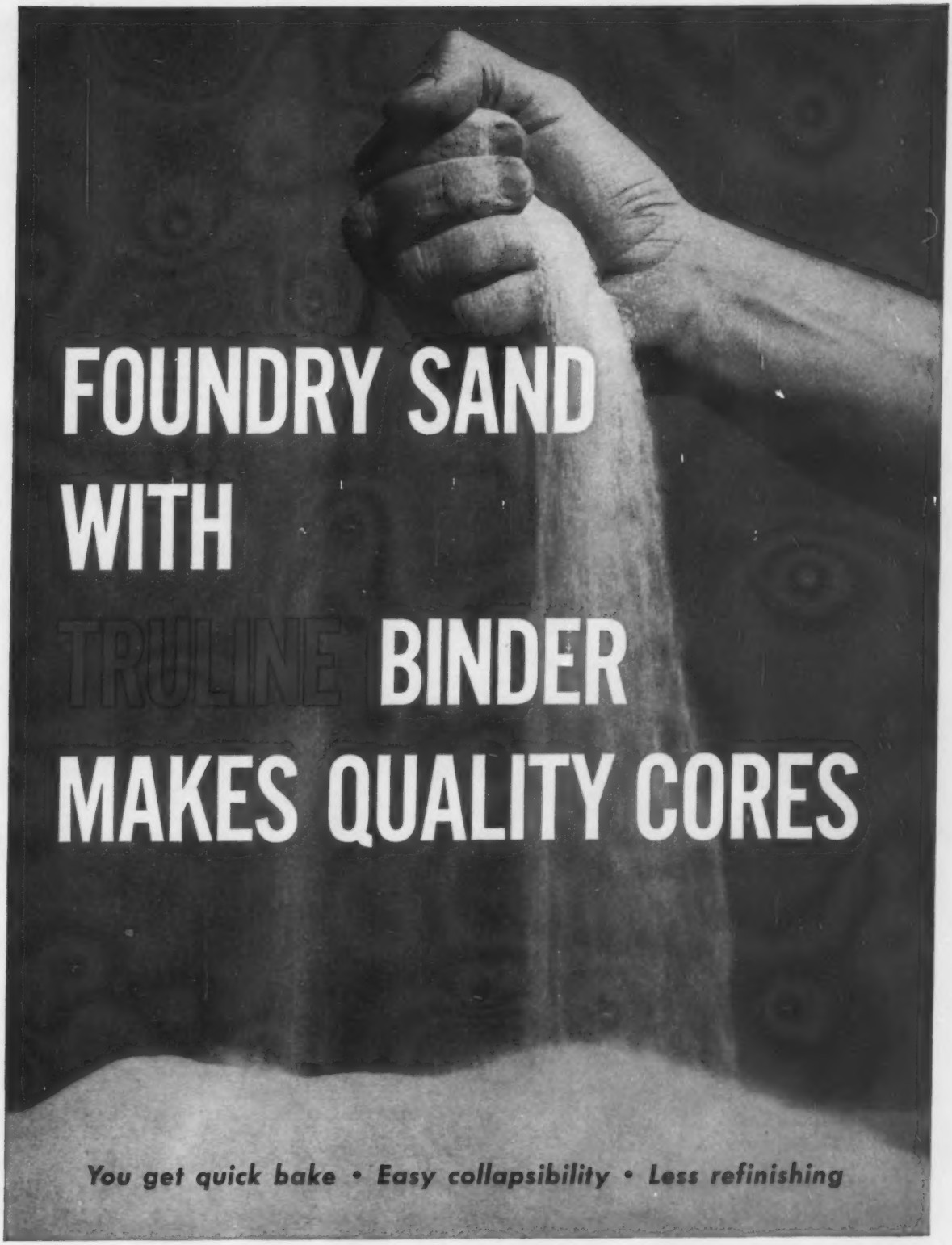
WEDRON SILICA CO.
135 S. LaSalle St., Chicago 3, Ill.

New casting techniques have been developed to produce more accurate castings that require less machining. This is the new money-saving dimension in industry that demands better foundry sands.

Wedron's pure, rounded-grain is the answer in case after case, where other sands fail. Where accuracy is demanded, Wedron's Silica Sand can meet all specifications and give outstanding results.

With the recent introduction of many new core binders, the foundry industry has become increasingly more aware of the advantages of round-grain (less-binder-usage) and purity (proper performance of binder). Wedron offers you a complete line of casting sand—17 grades from which to choose—Frank Pattie. For more information circle No. 58 on Reader Service Card.

Continued on Page 106



Naval Stores Department

HERCULES POWDER COMPANY

INCORPORATED

Hercules Tower, 910 Market Street, Wilmington 99, Delaware

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Circle No. 160, Pages 137-138

Continued from Page 104

WHEELABRATOR CORP.
1495 Brykit St., Mishawaka, Ind.

It's abrasive quality that really matters in buying blast cleaning abrasives. Top quality Wheelaborator steel shot is the hardest steel shot ever made—almost 10 RC harder than low priced steels. It hits harder, cleans faster, rebounds better to clean hard-to-reach areas. And it lasts much longer than softer abrasives. Wheelabrator experience in pioneering airless blast cleaning progress has always meant greater savings. For more information circle No. 106 on Reader Service Card.

WHIRL-AIR-FLOW CORP.
650 25th Ave., S.E., Minneapolis 14, Minn.

Use of the Whirl-Air-Flow system at the Central Machine Works, Minneapolis, has paid big dividends. Sand preparation, delivery, and shakeout return are handled automatically under the control of one man rather than the three needed previously. Whirl-Air-Flow transfer switches strategically located permit delivery of sand to the various stations or to the overhead silo at the touch of a button. Maximum free floor space is achieved through this unique overhead storage system. Pneumatic conveyor systems can be engineered to individual requirements, boosting production with cost savings. For more information circle No. 107 on Reader Service Card.

WHITING CORPORATION
Harvey, Ill.

One word that's most often on the lips of the foundry manager is "How?" "How can I most profitably invest my capital dollars to hold and improve my place in the market?"

At Whiting, we are convinced that some of these answers can be found in such equipment as the water-cooled cupola and the Hydro-Arc electric furnace. There is nothing new about water-cooling as such, but what is new is the growing realization of the dollar saving potential that is inherent in a correct application of a water-cooled unit. We see such great benefits, that we are offering a free consulting service to foundrymen who are seriously considering an investment in this type of equipment.

The Hydro-Arc furnace is currently solving problems and answering that "how" question both as a batch type melting unit and as a duplex furnace. It was the Hydro-Arc control, as a matter of fact, that made cupola-electric furnace combinations a commercially practicable process. The costs of duplexing are more than returned by the savings realized from a reduction in castings losses and losses due to pigging of iron.

In jobbing iron foundries, the Hydro-Arc is an ideal unit for batch duplexing cupola metal since the exact type of iron for any specific job can be made by adjusting the analysis with steel scrap and alloy additives. In steel mills and foundries, Hydro-Arcs of all sizes are used in batch type melting, producing irons and steels of practically all grades—Walter R. Jaeschke, consulting metallurgical engineer. For more information circle No. 16 on Reader Service Card.

WIREBOUND BOX MANUFACTURING ASSOC.
222 W. Adams St., Chicago, Ill.

Bulk packing of metal ingots and finished castings in large size wirebound pallet bins for easier and more economical handling, storing, and shipping is bringing new cost-cutting efficiency to the foundry industry. From receiving platform through in-plant handling and to the shipping dock, the big pallet bins serve to deter pilferage and loss, aid safe high-stacking storage in minimum area, permit quick identification and inspection of product, and help bring about highly effective systemization of materials handling, storage and shipment.

Impressive reductions in labor costs result by the bins eliminating many manual handling or storing operations. Actually, the adoption of wirebound pallet bins by foundries is an extension of their use in the smelting industry and a fore-runner of wirebound containers used by foundry customers to ship their finished products.

Because of the great variety of requirements throughout industry, wirebound pallet bins are engineered, designed, and fabricated to meet specific needs as to dimensions, cube, pallet base design, and other factors. It is also important to note that many factories now stipulate that suppliers ship castings or other parts in wirebound pallet bins that can be taken directly to production line stations—John D. Capps. For more information circle No. 10 on Reader Service Card.

WOODWARD IRON CO.
Woodward, Ala.

Established in 1882, Woodward Iron Co. is one of the nation's largest independent and completely integrated producers of a wide range of quality pig iron. Within nine miles of its furnace plant, the company captures its raw materials, hauls them on its own railroad, and processes them into a variety of analyses, unequalled by any other company similarly engaged.

Versatility of Woodward's pig iron production is illustrated by the fact that it produces iron with a Silicon content of 0.75-4.00; Phosphorus, 0.08-1.50; and Manganese, 0.10-3.00. This extreme degree of flexibility allows the gray iron foundryman, with intricate problems, to secure an analysis of metal close to that required for a most exacting specification.

Woodward's four blast furnaces have a capacity of approximately 775,000 net tons per year. It is in position to serve in the supply of almost any type of merchant pig iron—F. W. Sheppard, vice president of sales. For more information circle No. 14 on Reader Service Card.

New Products and Processes

What else is new in foundry methods and equipment? Summaries are presented below. Circle corresponding number on free postcard, page 137. Mail it to us; we'll do the rest!

Automatic Ladle Delivers Clean Metal To Cold Chamber Quickly

Outstanding feature of a new automatic ladle is ability to deliver clean metal to cold chamber quickly, accurately, and dependably. Bottom entry and cover provide sub-surface fill to minimize oxide inclusions and hydrogen absorption. Complete electrical control system has a safety cancel feature automatically preventing metal pour if dies do not lock up. Ladle can be adapted for installation on practically all existing machines and furnaces. J. A. Kozma Co.

Circle No. 108, Pages 137-138

High Alumina Refractory Gives Great Increase in Densification

Hot load tests have demonstrated that new high-alumina refractory, a mullite-bonded corundum brick, has a combination of improved physical properties and hot strength characteristics.

Primarily, process achieves a great increase in densification, which lowers porosity of refractories by as much as 40 per cent, diminishing access of furnace fumes and slags. According to the company, development has increased by several hundred degrees temperature at which furnace walls will show no deformation under load. Harbison-Walker Refractories Co.

Circle No. 109, Pages 137-138

Electric High-Temperature Furnace Incorporates Controlled Atmosphere

Electric high-temperature furnace incorporates a controlled atmosphere cooling chamber, making it ideal for brazing operations involving small tools, dies and production parts.

It is capable of producing temperatures up to 2400 degrees F., and can be used for heat treatment of all high speed steels, including cobalt types. Can operate as part of a production line set-up, or used to handle special jobs in a small shop. Mounted on wheels, it can be easily moved. Waltz Furnace Co.

Circle No. 110, Pages 137-138

Remote Indicating Scale Insures Accurate Eye Level Reading

Remote indicating scale, insures accurate eye level reading. Load element and indicator are provided as separate units connected by flexible double wire braid hose. Load element can be picked up by crane hook to any reasonable height and indicator can be mounted at eye level where operator can accurately read any load applied to the hook. In operation load element is picked up by crane hook and hose paid out to weighing height. Indicator remains at easy reading level on a stand-up cart. Martin-Decker Corp.

Radial drill press . . . performance features, applications and some advantages of new unit are illustrated in bulletin. Press will drill to center, or at any point on a 32 inch square, do rapid multiple drilling and perform accurate angular drilling. Head may be positioned at any angle. Rockwell Mfg. Co., Delta Power Tool Div.

Circle No. 111, Pages 137-138

Wet Blasting Machine Stresses Design Simplicity

Wet blasting machine is offered either with pneumatic action for greatest simplicity or with a motorized pump for greater output.

Packless pump has a special wear plate which prolongs service life. Both impellers and special wear plate are quickly and easily replaced at very moderate cost. Downtime is virtually eliminated. Features include window washer, movable gun mount, removable hatch for blasting of long parts, high capacity exhaust fan and filter and instant slurry change. Metal Improvement Co.

Circle No. 112, Pages 137-138

Production Status System Gives Minute-to-Minute Accounting

A system for recording production totals and production rates, computing machine efficiencies and analyzing downtime has been introduced. Unit records and displays graphically production status of any number of machines minute-by-minute throughout day.

Graphs show total number of pieces produced during shift or day; rate at which they were produced, minute-by-minute, in relation to what is normal for machine; when downtime occurred on any machine; how long downtime lasted; reason for downtime. Keinath Instrument Co.

Circle No. 113, Pages 137-138

Die Casting Quench Eliminates Rejects Due to Water Corrosion

Special die casting quench eliminates scumming, foul odor, chip and dirt flotation and blistering rejects due to water corrosion.

Usable for both aluminum and zinc castings, it requires no heating, special tanks or equipment, will not turn rancid, remains stable under production heat buildup and retains its efficiency over many die changes. Northwest Chemical Co.

Circle No. 114, Pages 137-138

Aluminum Casting Welding Easier with All-Position Electrode

For D.C. reverse polarity welding of aluminum castings, company announces its all-position aluminum electrode with a patented extruded flux coating.

Developing tensile strengths up to 28,000 psi, high-quality, aluminum alloy 4043 core wire is combined with an extruded flux coating, reportedly giving quiet welding and dense, spatter-free deposits at low amperages. Slag removal and deposition control are said to be far superior to standard electrodes. All-State Welding Alloys Co.

Circle No. 115, Pages 137-138

1 Whirl-Air-Flow system does 2 jobs!

PHOTO SHOWS Shakeout in immediate foreground. Note Transfer Switch. Visible beneath 100-ton overhead storage Silo is Beardsley & Piper Speedmullor and System Control Panels.

PHOTO SHOWS Mullor Discharge and Feed Hopper of No. 150 Transporter. Note magnetic pulley to catch tramp iron and belt which automatically returns shakeout sand.

NEW SYSTEM AT CENTRAL MACHINE WORKS SPEEDS PREPARED SAND TO MOLDING STATIONS AND SHAKEOUT RETURN TO OVERHEAD STORAGE

For years the Central Machine Works, Minneapolis, struggled with their old method of handling sand. They needed three men to prepare sand on the floor, mull the facing sand in a small mullor and deliver needed quantities to each station by wheelbarrow.

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NEW TECHNOLOGY

INOCULATION INFLUENCE ON GRAY IRON STRUCTURE AT VARIOUS CARBON EQUIVALENCES

Progress Report
Gray Iron Division
Sponsored by
AFS Training & Research Institute

by H. D. Merchant, L. I. Toriello and J. F. Wallace

ABSTRACT

This project was conducted to investigate the influence of an effective inoculant on the structure of gray iron, particularly the graphitic structure and eutectic cell size. The materials and interest in this work were obtained from a research project currently sponsored at Case Institute of Technology by the AFS Training and Research Institute and performed under the direction of the Research Committee of the Gray Iron Division. The research reported in this paper is a sequel to the work reported recently[1] on the effect of inoculation on the risering of gray iron which was also sponsored by the AFS Training and Research Institute. This prior work indicated that more mold wall movement occurred in green sand molds with inoculated compared to uninoculated gray iron. The cause of this greater wall movement was hypothesized to be the more mushy type of solidification and finer eutectic cell size of the inoculated iron. This study was undertaken to explore this hypothesis.

INTRODUCTION

A ladle addition made as an inoculant may affect the mechanical properties of gray iron by influencing eutectic cell size, graphitic pattern and metallic matrix. It may also have some alloying influence whereby it may change composition and theoretical solid-liquid and solid-solid transformation temperatures. The effectiveness of an inoculant is measured by considering all these influences on a solidified casting. The purpose of this study was to examine the effects of additions of a known effective inoculant of 0.5 per cent Si as FeSi containing appreciable aluminum and calcium on eutectic cell size, graphitic pattern and metallic matrix in various grades of unalloyed hypoeutectic and hypereutectic gray irons.

H. D. MERCHANT is Rsch. Met., Owens-Illinois Glass Co., Toledo, Ohio; L. I. TORIELLO is Rsch. Asst., and J. F. WALLACE is Assoc. Prof. of Met. Engrg., Case Institute of Technology, Cleveland.

Members of the Research Committee of the AFS Gray Iron Division are: J. S. Vanick, *Chairman*, R. A. Clark, W. O. McFatridge, J. E. Rehder, D. Sanner, W. Edens, C. F. Walton, K. F. Echard and S. C. Massari.

(Submitted in partial fulfillment of the requirements for Ph.D. degree for H. D. Merchant.)

To permit a direct comparison of the inoculated and uninoculated irons without an alloying influence from the silicon addition, it was compared with gray iron of the same composition which was alloyed with 0.5 per cent silicon metal. The latter has been shown to be a poor inoculant.[2] The subject of inoculation of gray iron has been widely investigated, and is the subject of many excellent publications.[3-5]

The results obtained in this work, however, only apply to the particular procedure employed, such as melting practice, super-heating and pouring temperature, inoculation procedure, etc. Variations in these factors will influence the inoculation effect at various carbon equivalences to a marked extent. The use of the high frequency induction furnace undoubtedly influenced these results. An effort was made to standardize these conditions in this work so that the influence of only composition could be determined. Accordingly, one should not expect to find similar results at the same carbon equivalences unless these other variables are similar in the iron poured in the foundry in question.

PROCEDURE

The casting employed in this investigation was a cylindrical bar 2 in. diameter and 9 in. long. It was cast horizontally utilizing a blind riser located at one end of the casting. Riser and riser neck were dimensioned according to formulas developed in a recent investigation, and were designed to be adequate for the size of casting and type of iron poured.[6] The casting was single gated tangentially into the riser, utilizing optimum pouring times and gating systems recommended by another recent report.[7]

Forty-six heats were melted within a carbon equivalent range of 3 to 4.7 per cent. All iron was melted in a 30 lb induction furnace. The metal charge consisted of various amounts of pig iron, steel and gray iron scrap. The final chemical composition of the heats is presented in the table. The heats have been arranged in order of increasing carbon equivalence in this table. The furnace and pouring temperatures were approximately 2700 and 2550 F (1482 and 1399 C), respectively, as checked by Pt – Pt-10 per cent Rh thermocouple. Care was taken to control tapping, inoculating and pouring temperatures as closely as possible. Such control is essential because of their

observed influence on the mode of solidification.[8,9]

The 46 heats were melted in pairs with about the same composition for each pair. Sufficient silicon metal to add 0.5 per cent silicon was added to the first heat in each pair at least 15 min before pouring; 0.5 per cent silicon, as 85 per cent grade ferrosilicon containing significant quantities of aluminum and calcium, was added to the furnace in the second heat of each pair just before pouring. After the additions were plunged into the melt, the molten iron was stirred vigorously with a steel rod for a few seconds, and allowed to drop to the desired temperature be-

DATA ON COMPOSITION, BRINELL HARDNESS AND EUTECTIC CELL COUNT FOR INOCULATED AND UNINOCULATED IRONS OF VARIOUS CARBON EQUIVALENCES

Pair No.	Treatment	Composition,[1] % C	Si	C.E.[2]	E.G.[3]	Bhn	Avg. No. of Cells/sq in.	No. of Cells/sq in. at Various Distances from the Casting Surface, in. 0.08	0.34	0.41	0.58	0.73	0.88
1	Si[A,B]	2.61	1.49	3.11	0.76	401	—	—	—	—	—	—	—
	FeSi	2.58	1.46	3.07	0.73	248	1210	1306	1004	977	904	684	450
2	Si	2.79	1.52	3.30	0.94	229	285	316	247	80	207	127	170
	FeSi	2.73	1.72	3.30	0.90	217	975	1138	880	650	493	445	400
3	Si	2.89	1.55	3.41	1.05	229	570	—	—	—	—	—	—
	FeSi	2.80	1.85	3.42	0.99	229	907	958	804	835	560	356	435
4	Si	2.95	1.54	3.46	1.10	197	292	375	268	203	193	190	160
	FeSi	2.95	1.69	3.51	1.12	204	880	920	750	620	525	468	423
5	Si	2.97	1.75	3.55	1.15	187	384	510	208	240	235	215	183
	FeSi	3.03	1.76	3.62	1.21	192	844	950	783	560	413	338	342
6	Si	2.92	2.08	3.61	1.13	197	445	498	418	255	266	156	263
	FeSi	3.04	1.99	3.70	1.24	201	875	910	793	625	525	408	380
7	Si	3.05	2.19	3.78	1.27	179	480	590	418	279	249	224	149
	FeSi	2.95	2.17	3.67	1.09	197	1070	1115	960	665	635	608	411
8	Si	2.84	2.60	3.71	1.10	217	422	474	348	300	331	224	193
	FeSi	2.84	2.45	3.66	1.09	232	1031	1196	995	772	636	565	395
9	Si	3.01	2.38	3.80	1.25	137	646	—	—	—	—	—	—
	FeSi	3.14	2.37	3.93	1.38	167	935	1013	790	438	515	540	343
10	Si	3.12	2.37	3.91	1.36	146	525	673	455	352	194	182	182
	FeSi	3.16	2.32	3.93	1.40	170	985	1063	825	630	590	510	343
11	Si	3.16	2.31	3.93	1.39	157	570	611	553	361	405	340	264
	FeSi	3.17	2.27	3.93	1.40	163	770	812	745	745	360	319	360
12	Si	3.62	1.21	4.02	1.74	170	236	—	—	—	—	—	—
	FeSi	3.64	1.29	4.07	1.77	159	316	—	—	—	—	—	—
13	Si	3.24	2.55	4.09	1.50	157	515	578	465	288	303	244	229
	FeSi	3.15	2.29	3.91	1.38	164	735	918	685	345	322	179	385
14	Si	3.47	1.96	4.12	1.67	126	358	495	357	201	129	153	160
	FeSi	3.39	1.92	4.03	1.58	207	405	—	—	—	—	—	—
15	Si	3.51	2.06	4.20	1.71	140	310	388	330	182	129	122	137
	FeSi	3.53	2.18	4.26	1.75	107	210	—	—	—	—	—	—
16	Si	3.35	2.60	4.30	1.61	106	465	655	216	260	250	231	215
	FeSi	3.33	2.91	4.67	1.62	108	560	615	535	426	382	295	160
17	Si	3.45	2.16	4.17	1.67	130	—	—	—	—	—	—	—
	FeSi	3.55	2.52	4.39	1.72	106	675	820	483	508	540	583	445
18	Si	3.53	2.54	4.38	1.72	103	264	328	177	189	184	229	103
	FeSi	3.45	2.93	4.43	1.63	93	595	645	543	319	395	300	194
19	Si	3.09	3.97	4.41	1.39	123	263	355	212	156	165	145	114
	FeSi	3.08	4.17	4.47	1.34	116	510	622	397	345	350	190	320
20	Si	3.47	3.35	4.59	1.53	126	282	—	—	—	—	—	—
	FeSi	3.37	3.27	4.46	1.56	109	426	550	413	293	194	137	91
21	Si[B]	3.68	2.96	4.67	1.62	99	—	—	—	—	—	—	—
	FeSi[B]	3.71	2.70	4.61	1.68	103	—	—	—	—	—	—	—
22	Si[B]	3.69	2.55	4.54	1.71	98	—	—	—	—	—	—	—
	FeSi	3.60	2.95	4.58	1.62	96	582	626	565	464	435	374	422
23	Si[B]	4.25	1.29	4.68	2.02	116	—	—	—	—	—	—	—
	FeSi[B]	4.23	1.30	4.66	2.00	131	—	—	—	—	—	—	—

NOTES:

Si — 0.5% Si added as silicon metal.
FeSi — 0.5% Si added as FeSi just before pouring.
1 — All heats contained approximately 0.05% P, 0.085% S and 0.80% Mn.
2 — % C.E. = % Carbon equivalent = %C + ⅓ Si.
3 — % E.G. = % Eutectic graphite = %C + 0.1% Si − 2.0 (hypoeutectic).
= 2.3 − 0.23% Si (hypereutectic).
A — Solidified white.
B — Eutectic cells could not be revealed.

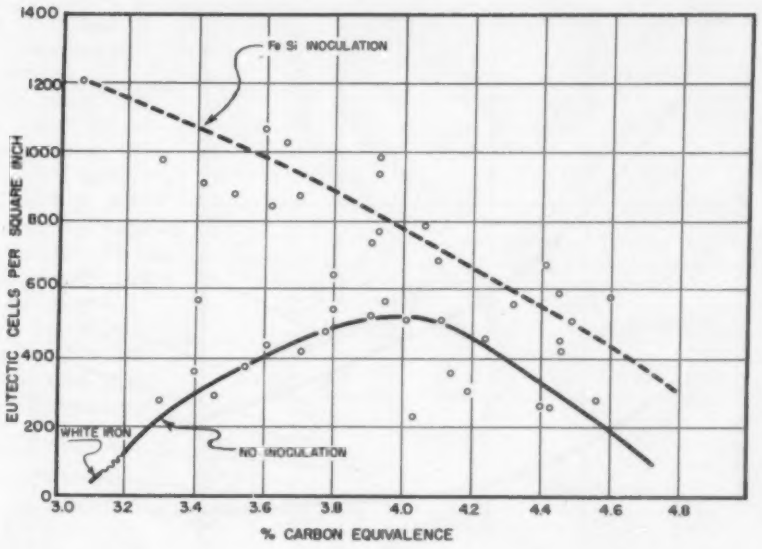

Fig. 1 — Relationship between eutectic cell count and carbon equivalence for uninoculated and inoculated cast irons.

fore pouring directly into the mold. The chemical analysis of silicon metal and 85 per cent grade ferrosilicon is:

Inoculant	Si	Al	Ca	Fe
Silicon Metal, %	Rem.	0.05	0.001	0.5
85% Ferrosilicon, %	82.54	1.96	0.92	Rem.

All molds were made in green sand on a jolt-squeeze molding machine under equivalent conditions. The molds were compacted in slip flasks, stripped and jacketed for pouring. At least a 2 in. layer of sand surrounded all parts of the casting to prevent rapid loss of heat at any location. The castings were allowed to solidify without moving, and were cooled at least one hr in the mold before shakeout. The green sand employed was a synthetic type utilizing Michigan Lake sand (AFS 50 fineness) and containing about 4 per cent moisture and 5 per cent Western bentonite bond.

Composition, Hardness, Structure Data

After cooling to room temperature, all castings were sand blasted and processed to obtain the desired data on composition, hardness and structure. Two ½-in. thick transverse sections were cut from the longitudinal center of each casting. One piece was employed to determine the eutectic cell size after proper polishing and etching by special techniques. The same piece was later used to ascertain the Brinell hardness at a location half-way between the surface and center of the casting.

A ⅝-in. wide, 1 in. long and ⅜-in. thick radial piece was cut from the second piece to examine the microstructure from the center to the surface of the casting. A representative microphotograph was taken approximately half-way between surface and center of the casting. The graphitic pattern and matrix structures were examined in each case.

RESULTS AND DISCUSSION

The eutectic cell count (number of cells/sq in.) for the uninoculated and inoculated irons is plotted as a function of per cent carbon equivalence (C.E.) and per cent eutectic graphite (E.G.) in Figs. 1 and 2, respectively. The method of computing carbon equivalence and eutectic graphite is shown in the table. For uninoculated iron, the cell count increases with carbon equivalence or eutectic graphite, attains a peak at about 4.0 per cent carbon equivalence or at 1.35 per cent eutectic graphite, and then gradually decreases.

For inoculated iron, on the other hand, the cell count is initially high for low carbon equivalent irons, but the cell size gradually becomes larger or the cell count becomes smaller with increasing carbon equivalence or eutectic graphite. The entire casting section is white below about 3.2 per cent carbon equivalence in uninoculated iron, but it remains completely gray for as low as 3 per cent carbon equivalence when effective inoculation is employed.

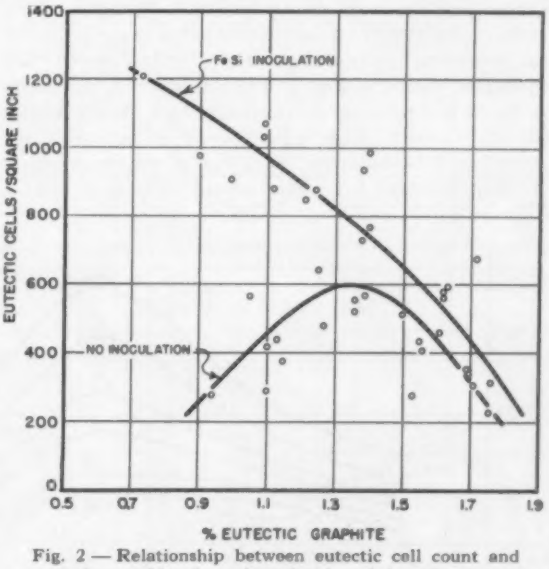

Fig. 2 — Relationship between eutectic cell count and eutectic graphite in uninoculated and inoculated cast irons.

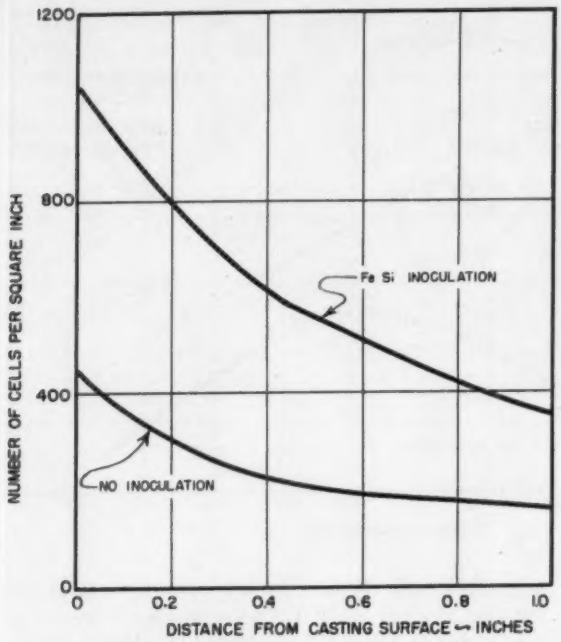

Fig. 3 — Relationship between eutectic cell count and distance from casting surface for a typical set of uninoculated and inoculated cast irons with carbon equivalence of 3.6 per cent.

The addition of 0.5 per cent silicon, as 85 per cent ferrosilicon containing appreciable amounts of aluminum and calcium, as an inoculant is highly effective in reducing the eutectic cell size of cast iron for low carbon equivalent irons. Effectiveness of the inoculant, as shown in Figs. 1 and 2, diminishes gradually as the carbon equivalence or eutectic graphite increases.

A macroscopic survey of a typical casting section of the 2 in. diameter cylinder for both inoculated and uninoculated irons shows a fine eutectic cell or a high cell count at the surface that becomes coarse towards the center. This is illustrated graphically for 3.6 per cent carbon equivalent uninoculated and inoculated irons in Fig. 3. The inoculant is apparently more effective at the surface than at the center of the casting. This observation stresses the importance of considering the effect of an inoculant at specific distances from the casting surface, so that it is possible to estimate its effectiveness in castings of various sizes.

The eutectic cell count at various distances from the casting surface is tabulated in the table for most of the heats. For the whole range of compositions, the eutectic cell count at various distances from the casting surface is plotted in Fig. 4 for uninoculated iron, and in Fig. 5 for inoculated iron. It is observed that the pattern of variation in eutectic cell count with composition is similar in all parts of the casting; the cell count is highest at about 4.0 per cent carbon equivalence for the uninoculated iron and decreases for lower and higher values. The extent of this difference in the cell count is greater at the surface than at the center of the casting for all compositions in both inoculated and uninoculated irons.

Inoculant Effectiveness

The effectiveness of the inoculant, expressed as per cent increase in cell count due to inoculation, can be calculated for the whole range of compositions from Figs. 4 and 5. The results of these computations are plotted in Fig. 6 for the surface and for the center of the castings. It is observed that the inoculant is most effective in low carbon equivalent irons and least effective in about 4.0 per cent carbon equivalent irons. As the carbon equivalence increases, the effectiveness of the inoculant decreases, attains a minimum at about 4.0 per cent and then increases slightly with higher carbon equivalence in the hypereutectic range.

Figure 6 also demonstrates that the effectiveness of the inoculant is greater at the surface than at the center of the casting. The difference in effectiveness of the inoculant is more in low carbon equivalent irons than in high carbon equivalent irons. For the 2 in. diameter circular section, the effectiveness of the inoculant at the surface is about twice as great as at the center in all irons with less than 4.0 per cent carbon equivalence, and is about 1½-times as great in the irons with higher than 4.1 per cent carbon equivalence. The average effectiveness of the inoculant projected over the entire casting section, is shown as a dotted curve between the surface and center curves. It is apparent that the average effectiveness curve will decrease as section thickness increases.

Because of the tendency of primary graphite to float in hypereutectic irons, discrete variations in composition sometimes occur. This results in uneven distribution of eutectic cell sizes across the casting sec-

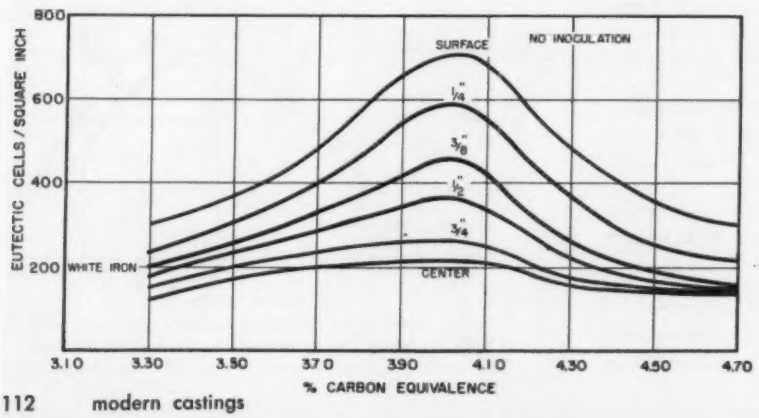

Fig. 4 — Relationship between eutectic cell count, carbon equivalence and distance from casting surface for uninoculated cast irons in 2 in. rounds.

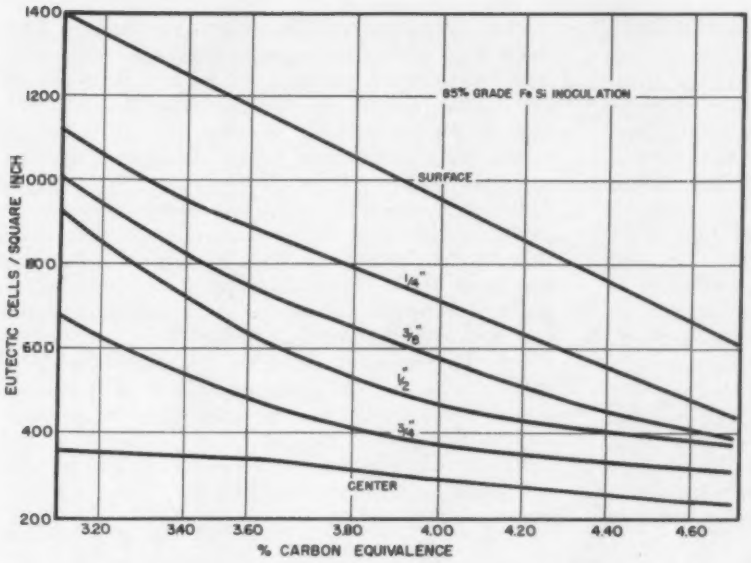

Fig. 5 — Relationship between eutectic cell count, carbon equivalence and distance from casting surface for inoculated cast irons in 2 in. rounds.

tion. Figure 7 shows three such anomalies. Figure 7A illustrates fine cells at the surface and near the top of the horizontal casting. The cell size gradually becomes coarse towards the bottom portion of the casting. This anomaly suggests flotation of nuclei or segregation towards the top of the casting during solidification.

Figure 7B contains fine eutectic cells at the center, and the cells gradually become coarse towards the surface of the casting. This suggests the migration of nuclei or nucleating conditions towards the center of the casting during solidification. A third type of anomaly, found more often in hypoeutectic irons, is shown in Fig. 7C. Eutectic cells are fine at the surface, but they assume maximum coarseness half-way between surface and center of the casting. The center contains both fine and coarse cells. The size, shape and distribution of graphite also change in uninoculated and inoculated irons as the carbon equivalence is varied.

These changes are illustrated by the various microphotographs in Fig. 8. The microstructures examined were located at midlength of the 8 in. long, 2 in. diameter bar half-way between the surface and center. Low carbon equivalent, hypoeutectic, uninoculated iron (3.30 per cent C.E.) shows highly interdendritic, fine, Type E graphite (Fig. 8A); inoculation of the same iron also results in an interdendritic location but the flakes are much thicker and in some respects like Type A graphite (Fig. 8B).

Medium carbon equivalent, uninoculated, hypoeutectic iron (3.75 per cent C.E.) contains a slightly interdendritic, short to medium length randomly oriented, Type A graphite with a few isolated areas of fine Type D graphite (Fig. 8C); inoculation eliminates Type D graphite, and produces a slightly longer and thicker, less branched Type A graphite (Fig. 8D). Higher carbon equivalent, uninoculated, hypoeutectic iron (4.10 per cent C.E.) has long, thin, branched Type A graphite (Fig. 8E); inoculation gives slightly shorter and thicker, unbranched, Type A graphite (Fig. 8F).

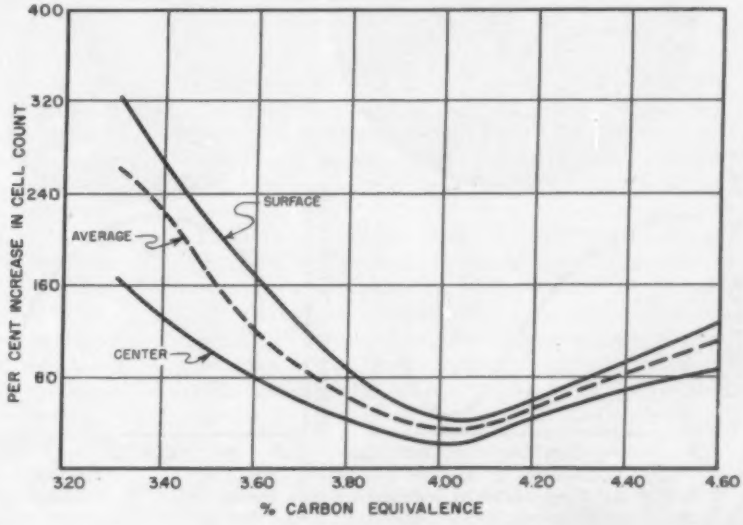

Fig. 6 — Increase in eutectic cell count from inoculation for various carbon equivalences at the surface, center and for the average in a 2 in. round.

From the foregoing observations, one may conclude that, for the hypoeutectic range of cast irons, as the carbon equivalence is increased in uninoculated iron, the graphitic pattern changes from Type E or D to short Type A to long Type A graphite. Inoculation makes the appearance of the dendritic pattern less pronounced and produces randomly distributed, Type A graphite. As the carbon equivalence is increased in these inoculated irons, the graphitic pattern varies from short and thick Type A graphite flakes to long and comparatively thin Type A graphite flakes.

The effect of inoculation and carbon content on the eutectic graphite in hypereutectic iron is not as clear-cut as in the hypoeutectic case but does show a trend. The hypereutectic irons close to the eutectic have a similar eutectic structure to the high carbon, hypoeutectic irons, i.e., long, thin, branched Type A graphite in the uninoculated iron, similar to that shown in Fig. 8E. When this hypereutectic iron is inoculated, a slightly shorter and thicker unbranched Type A graphite similar to that in Fig. 8F is obtained.

As the carbon content of the hypereutectic irons is increased, the eutectic structures appear similar to the lower carbon hypoeutectic irons. Thus, when the carbon content of hypereutectic irons is high, many areas of Type D graphite appear, particularly in the uninoculated irons. It appears as though the kish graphite solidification was removing some of the nucleation sites for eutectic graphite solidification, and the kish does not appear to act as nucleation sites for eutectic graphite solidification.

It can be concluded from these results that as the carbon equivalence of uninoculated hypoeutectic irons is increased, the cell size becomes smaller. The larger cell size of the low carbon equivalent uninoculated irons is accompanied by a Type D graphite. As the carbon content increases, the cell size becomes smaller and the graphite changes to fairly long, thicker, unbranched flakes. This is in agreement with the results of Adams.[10]

However, the cell size of inoculated hypoeutectic irons increases with higher carbon equivalence. The lower carbon equivalent irons have a small cell size and short, thick Type A graphite flakes. The higher carbon equivalent inoculated irons exhibit a larger cell size with thinner and longer Type A graphite flakes. The resulting flakes in the inoculated, high carbon, hypoeutectic irons are only slightly shorter and thicker than the uninoculated irons of the same composition.

The per cent eutectic graphite in gray iron may be calculated by these equations:

$$\% \text{ E.G.} = \% \text{ C} + 0.1\% \text{ Si} - 2.0 \text{ (hypoeutectic iron)}$$
$$= 2.3 - 0.23\% \text{ Si} \quad \text{(hypereutectic iron)}$$

The per cent eutectic graphite depends upon carbon and silicon contents in hypoeutectic irons, but only upon silicon content in hypereutectic irons. An improved correlation can be established between per cent eutectic graphite and graphitic pattern than between per cent carbon equivalence and graphitic pattern. For uninoculated irons containing less than about 1.35 per cent eutectic graphite, increasing eutectic graphite has an effect of changing the graphitic pattern from Type D to Type A; for all irons containing more than 1.35 per cent eutectic graphite, increasing eutectic graphite has an effect

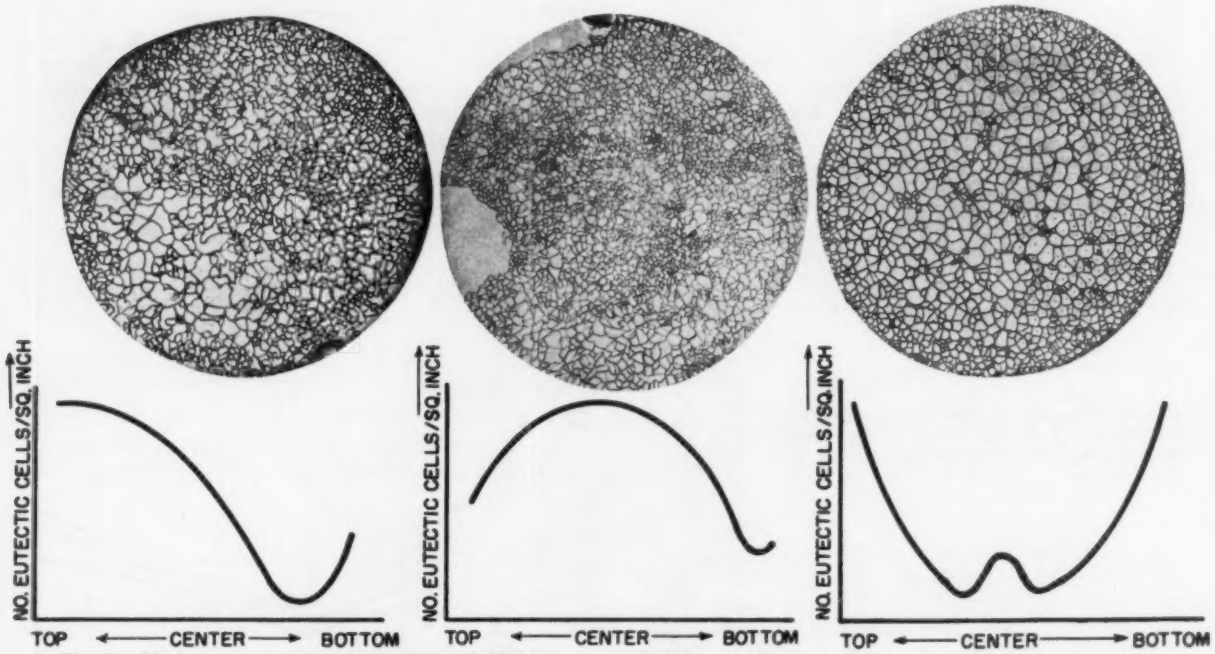

Fig. 7 — Variations in eutectic cell size distribution across the 2 in. round in uninoculated hypereutectic gray iron. Schematic plot of cell count across section below, in each case. *Left to right* — A — Fine cell size at top, B — fine cell size at longitudinal center, C — Fine cell size at top and bottom, discontinuous at center.

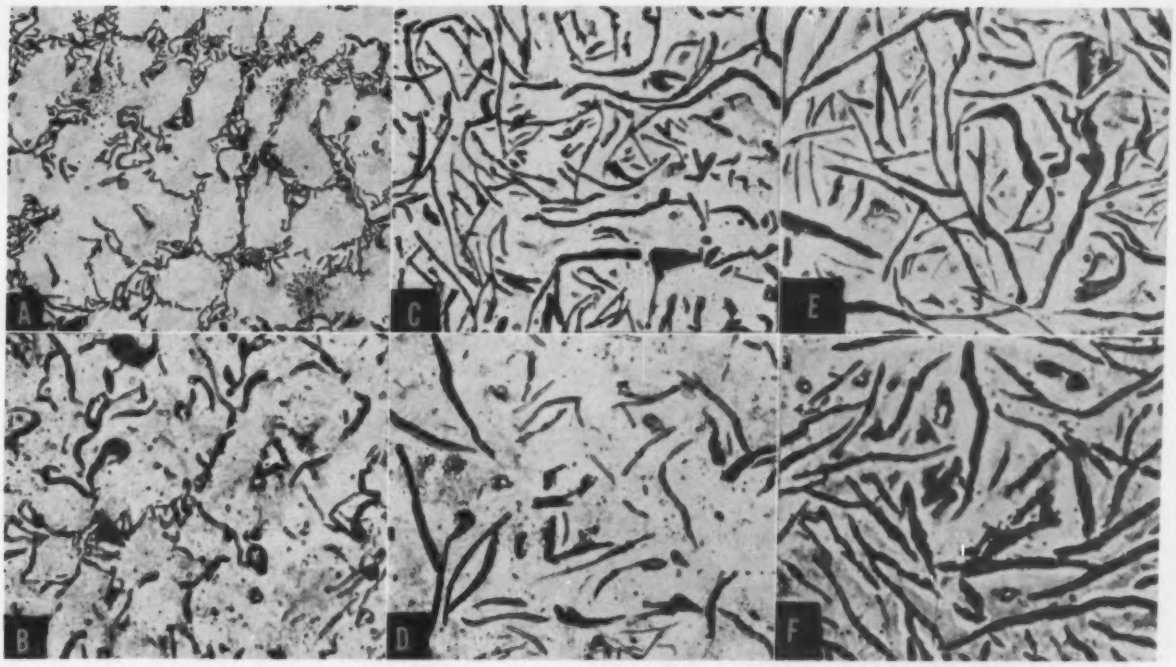

Fig. 8 — Shape and distribution of graphite structure of uninoculated and inoculated irons at various carbon equivalences. *Top row* — uninoculated (A, C, E), *bottom row* — inoculated (B, D, F). *Left to right* — 3.30 (A, B), 3.75 (C, D) and 4.10 (E, F) per cent carbon equivalence. Etched. 100 ×.

of changing the graphitic pattern from Type A to Type D.

The amounts of ferrite and pearlite in the matrix follow generally established patterns. Some ferrite is obtained in the low carbon equivalent iron when Type D graphite flakes are present, as illustrated in Fig. 9A. Ferrite also occurs in the higher carbon equivalent irons surrounding the larger graphite flakes, as shown in Fig. 9C. Inoculation alters the graphitic structure as previously discussed, and increases the amount of pearlite, as demonstrated in Figs. 9B and 9D. While the matrix is predominately pearlite in inoculated irons, the lamellar spacing appears coarser than for the pearlite grains in the uninoculated irons.

The larger amount of pearlite in the inoculated irons in the 3.0 to 4.30 per cent carbon equivalent range results in an increase in hardness, as indicated from the Brinell hardness number of each iron in the table. However, above 4.30 per cent carbon equivalence, the graphitic structure and the matrix of the uninoculated and inoculated irons are essentially the same, and, consequently, the effect of inoculation on hardness in hypereutectic irons is both somewhat erratic and slight in most cases. Pairs No. 15 through 23 in the table show the erratic hardness results. The uninoculated irons at or below 3.30 per cent C.E. are mottled or white in pairs 1 and 2. Accordingly, the uninoculated iron is harder in these cases. Inoculation of these irons tends to reduce or eliminate the extent of mottling and lower hardness.

The results obtained in this work are only applicable to the particular conditions of melting and composition employed. The influence of inoculants on the structure of any iron depends on the existence of prior nuclei in the iron. If these nuclei are present in large amounts, inoculation is not effective; however, if these nuclei are lacking, inoculation is effective. Foundrymen are well aware that the chilling properties of an iron will vary for the same carbon equivalence.

The chilling behavior of an iron is a measure of the existence of nuclei for eutectic graphite solidification. In this work, the authors attempted to standardize the melting conditions, so that the effect of carbon equivalence on the influence of inoculation could be measured. In practice, however, carbon equivalence or composition is only one of the significant variables, and the desirability and influence of inoculation at a given carbon equivalence will depend on other factors as well.

CONCLUSIONS

The eutectic cell size of uninoculated irons attains a minimum at about 4.0 per cent carbon equivalence or 1.35 per cent eutectic graphite. The cell size becomes larger as the carbon equivalence or eutectic graphite either increases or decreases from the above values.

Effective inoculation with 0.5 per cent silicon, as 85 per cent ferrosilicon containing appreciable aluminum and calcium, greatly decreases the eutectic cell size of low carbon equivalent gray irons. The reduction in cell size from inoculation decreases with increasing carbon equivalence or eutectic graphite and inoculation has only a slight influence on the structure of irons over 4.0 per cent carbon equivalence.

The eutectic cell size of both inoculated and uninoculated irons is finer at the surface than at the center of a 2 in. diameter round for all compositions.

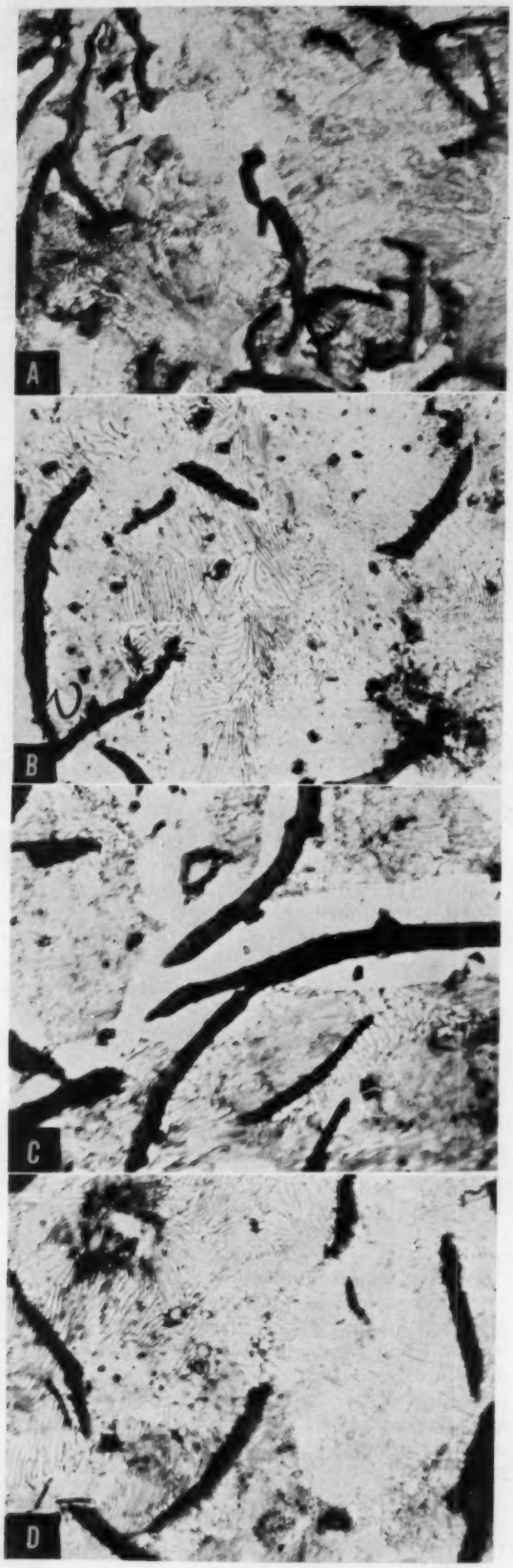

Fig. 9 — Matrix structure of various uninoculated and inoculated irons. *Top to bottom* — A and C, uninoculated, B and D, inoculated. A and B, low carbon equivalence, C and D, high carbon equivalence. Etched. 500 ×.

The influence of FeSi inoculation in decreasing the cell size is approximately twice as large at the surface as the center below 4.0 per cent carbon equivalence, and about one and one-half times as large over 4.0 per cent carbon equivalence.

The graphitic pattern of uninoculated irons is altered from Type D to Type A as the carbon equivalence of the iron is increased from 3.30 to 4.30 per cent; raising the carbon equivalence over 4.30 per cent causes the graphite to change from Type A back towards Type D. Fine Type A graphite occurs with large eutectic cells and coarse Type A graphite ensues with fine eutectic cells.

Effective inoculation with FeSi always produces Type A graphite, and apparently, because of its effect on the eutectic solidification temperature, reduces the dendritic pattern of the primary austenite to some extent. The fine eutectic cells of inoculated irons produce a thick, short Type A graphite flake; the larger cells result in a longer, thinner graphitic flake.

Some ferrite occurs in these unalloyed, 2 in. round cast sections around the Type D graphite of the low carbon equivalent irons and Type A graphite of the irons near the eutectic composition. Inoculation of these hypoeutectic irons eliminates all or nearly all of the ferrite, and produces a fairly coarse pearlite and a higher hardness. The structures of the inoculated and uninoculated hypereutectic irons are similar and the effect of inoculation on hardness is small.

The results obtained and conclusions based on these results apply to the melting and inoculation conditions utilized. Changes in melting stock, melting technique and inoculating conditions will undoubtedly alter the extent of the structural variation and compositions at which the finer cell sizes occur.

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NEWS and VIEWS

T&RI Stresses Buying
Foundries Open for Visits

Varied Castings Congress Program Offers Week of Top Flight Events

Supplementing the extensive technical papers program at the 65th Castings Congress are many other highlights which make the annual meeting the outstanding event of the metalcasting industry.

Included are evening shop courses, division-sponsored luncheons, various events of the Society itself, a plant visitation program, and special events for the ladies.

Forming an integral part of the Congress are the shop courses and luncheons presented by the AFS divisions. Six shop courses will be held at the Sheraton Palace Hotel during the evening so that local foundrymen can attend. On Monday, May 8, the Sand and Pattern Divisions will hold shop courses; on Tuesday, sessions will be held by the Gray Iron and Sand Divisions; and on Thursday, the Gray Iron and Ductile Iron Divisions will conduct the final two sessions.

The luncheon schedule: Tuesday, Brass and Bronze; Wednesday, Light Metals and a joint meeting of the Gray, Ductile, and Malleable Iron Divisions; Thursday, Steel and Die Casting and Permanent Molding.

Wednesday, May 10, will be the most important single day in the Society's calendar. The entire morning will be devoted to AFS activities including election of officers, presentation of Awards of Scientific Merit, and Service Citations, honoring of apprentice winners, the President's address, and the Hoyt Memorial Lecture by Jack Caine (see page 78).

The annual banquet will be held Wednesday evening at the Sheraton Palace Hotel. Three barbershop groups will perform. At the banquet, two AFS Gold Medals, the highest honor of the Society, will be presented.

Nominations for AFS officers and directors include: President, Albert L. Hunt, Superior Foundry, Inc., Cleveland; Vice-President, John A. Wagner, Wagner Castings Co., Decatur, Ill.

Directors: Daniel E. Best, Bethlehem Steel Co., Bethlehem, Pa.; Roger J. Hageboeck, Frank Foundries, Corp., Moline, Ill.; Dale Hall, Oklahoma Steel Castings Co., Div., American Steel & Pump Corp., Tulsa, Okla.; C. J. Lonnee, Alloyed Grairon Casting Corp., Ravenna, Mich.; Charles Ossenfort, Fairbanks, Morse Co., Kansas City, Kans.; and Carl O. Schopp, Link-Belt Co., Indianapolis.

M. E. Nevin, Wisconsin Centrifugal Foundry, Inc., Waukesha, Wis., has been elected a director by the AFS Board of Directors and will commence his term with directors named at the Congress.

Announce Schedule for Ladies Activities

Four days of activities are planned for ladies attending the Castings Congress. Friday, the fifth day, will be an open day for the ladies. The schedule:

Monday, May 8—Official AFS Tea, 3:00 pm, French Room, Sheraton-Palace Hotel.

Tuesday, May 9—Noon luncheon and fashion show, Room of the Dons, Mark Hopkins Hotel.

Wednesday, May 10—Continental breakfast in the Mural Room, Mark Hopkins Hotel, followed by a tour of the shopping area. Also the Annual Banquet, 7:00 pm, Garden Court, Sheraton-Palace Hotel.

Thursday, May 11—Meeting at the Sheraton-Palace Hotel for a sightseeing tour.

Castings Congress Registration Hours

Registration for all Castings Congress activities will be conducted at the Sheraton-Palace Hotel. Registration for the Congress and plant visitations will be in the lobby. Registration for the Ladies program will be conducted in Parlor A. The hours are:

Castings Congress—Registration from 8:30 am to 5:30 pm daily, except Friday when registration will close at noon.

Ladies Registration—Monday, Tuesday, and Wednesday—9:00 am to 3:30 pm. Thursday— 9:00 am to 11:45 am. There will be no registration on Friday.

Plant Visitations—Registration for plant visitation will be done by members of the Northern California Chapter. Hours will coincide with those for the Castings Congress.

Bay Area Foundries Open to Visitors

Twenty-two foundries within 30 miles of downtown San Francisco will be open for plant visitation by foundrymen attending the Castings Congress.

Included are jobbing and captive non-ferrous, steel, alloyed steel, and gray iron shops using such processes as shell, ceramic, and permanent molding as well as conventional and centrifugal casting.

In addition, the Mare Island Naval Shipyard and foundry will be open for inspection as well as the University of California student foundry.

San Francisco

M. GREENBERG'S SONS, INC., 765 Folsom St. (Wed. only, 9:00 am-3:00 pm).

A 107-year old firm manufacturing ornamental bronze, valves, and fittings.

PACIFIC BRASS FOUNDRY OF SAN FRANCISCO, 251 Second St. (Wed.-Fri., 9:00 am-3:00 pm).

Jobbing non-ferrous shop specializing in a wide variety of alloys.

SAN FRANCISCO IRON FOUNDRY, 260 Townsend St. (Mon.-Thurs., 8:00 am-3:00 pm).

Continued on page 120

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Circle No. 177, Pages 137-138

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South San Francisco

SUPERIOR ELECTROCAST FOUNDRY, 150 Harbor Way. (Mon. to Fri., 8:00 am-5:00 pm).
Small and medium steel castings.

Oakland

AMERICAN BRASS & IRON FOUNDRY, 7825 San Leandro St. (Wed. only, 12:00 to 3:00 pm).
Soil pipe and fittings.

AMERICAN MANGANESE STEEL DIV., AMERICAN BRAKE SHOE CO., 850 Ferry St. (Mon.-Thurs. 8:00 am to 3:30 pm).
Manganese steel castings.

Foundrymen-students at the Economical Purchasing of Foundry Materials course discuss a problem with instructor E. C. Troy, National Engineering Co., Chicago, center. Others are John Barclay, Birmingham Stove & Range Co., Birmingham, Ala.; Vassilios Papagiannis, Technica S. Nialcotsis, Piraeus, Greece; W. N. Stoney, Forest City Foundries Co., Cleveland; and Leon R. Denning, Stuart Foundry Co., Detroit.

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Circle No. 167, Pages 137-138

DESANNO FOUNDRY & MACHINE CO., 1919 Peralta St. (Wed.-Fri., 9:00 am-3:00 pm).
Non-ferrous foundry operated in conjunction with machine shop producing a variety of small parts and fittings.

EMPIRE FOUNDRY, 950 Nineteenth Ave. (Mon. only, 2:00 pm-4:00 pm).
Jobbing iron and steel foundry.

GENERAL METALS CORP., 550 85th Ave. (Wed only, 8:00 am-4:30 pm).
Diesel engines and jobbing iron and steel castings.

KNUTE PALMQUIST FOUNDRY, 4933 San Leandro St. (Wed.-Fri., 9:00 am-3:00 pm).
Jobbing non-ferrous foundry.

PHOENIX IRON WORKS, 2nd & Castro St. (Mon.-Thurs., 8:00 am-5:00 pm).
Gray iron, semi-steel, and nickel chromium steel.

SERVICE PATTERN & FOUNDRY, CO., 2870 Chapman St. (Wed. only, 9:00 am-3:00 pm).
Small non-ferrous jobbing shop.

VULCAN STEEL FOUNDRY, 2934 Ford St. (Mon. & Tues., appointment only).
Small and medium steel castings.

Berkeley

H. C. MACAULAY FOUNDRY CO., 811 Carlton St. (Mon. only, 9:00 am-3:00 pm).
Cast iron and ductile iron castings. Producers of Offenhauser engine block casting.

PACIFIC PRESSURE-CAST PRODUCTS, 1210 Fourth St. (Mon.-Fri., 8:00 am-5:00 pm).
Plaster matchplates and precision castings made in ceramic molds.

PACIFIC STEEL CASTINGS CO., 1333 Second St. (Mon. & Tues., appointment only).
Small and medium steel castings.

UNIVERSITY OF CALIFORNIA ENGINEERING DEPT. (Tues & Wed., 1:30 pm-3:30 pm).
Working student foundry with various experimental research and development projects.

Richmond

AMERICAN RADIATOR & STANDARD SANITARY CORP., Crutchell & Essex Sts. (Tues. only, advanced registration only).
Sanitary castings.

ATLAS FOUNDRY & MFG. CO., 3701 Collins Ave. (Mon. & Tues.,

9:00 am-3:00 pm).

Gray iron production castings.

EAST BAY BRASS FOUNDRY, 13th & Chesley Sts. (Wed. only, 8:00 am-5:00 pm).

Green sand, shell, and permanent mold non-ferrous castings.

Union City

UNITED STATES PIPE & FOUNDRY CO., Whipple Road. (Mon., Wed., Fri., 9:00 am-2:00 pm).

DeLavaud method of centrifugally casting iron pressure pipe.

Vallejo

MARE ISLAND NAVAL SHIP YARD. (Thurs. only, advanced registration only).

Non-ferrous, iron and steel castings for naval vessels.

Course Presents Buying Principles

Steps toward more economical purchasing of foundry materials were presented by industry authorities at the AFS Training & Research Institute course held in Chicago.

Included were basic principles and concepts, the necessary organization, special and legal aspects, related functions, budgetary operation and control, performance evaluation, policies, department procedures, purchasing of raw materials, true material costs, purchasing as related to profits, techniques in purchasing production and auxiliary materials, and buying of heavy foundry equipment.

Instructors for the course were Robert E. Schmidt, Hills-McCanna Co., Chicago; S. C. Massari, T&RI Director, G. D. Casgrain, Jr., Chicago Malleable Castings Co., Chicago; E. C. Troy, National Engineering Co., Chicago; and T&RI Training Supervisor R. E. Betterley.

Foundrymen-students attended from 11 states as well as Greece and Brazil.

One course, *Core Practices*, will be held during May. Course No. 8, will be held May 22-26 in Chicago. The fee is $90. This will be a concentrated core instruction program for foremen, sales engineers, supervisors, technicians, engineers, and management. Case problems are welcomed for class discussion.

On June 26-30, *Sand Testing*, Course No. 9, fee, $150, will be given in Detroit. This is a working course involving demonstrations and laboratory work. A field trip to a foundry is included.

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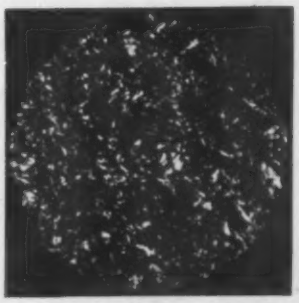

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Circle No. 168, Pages 137-138

CHAPTER NEWS

OREGON—Winning apprentices in local chapter contest received $25 bonds and their entries submitted for national competition. First place winners are: Don Sprague, Columbia Steel Casting Co., steel molding; Erich Stuchlik, Western Foundry Co., iron molding; Don Nealeigh, Oregon Brass Works, non-ferrous molding; and John Rondema, Western Foundry Co., wood pattern division.—by Bill Walkins

WENTWORTH INSTITUTE—Construction of an oil barrel-cupola in Iran as typical of the difficulties encountered in instituting a foundry and patternmaking course on limited funds was explained by former Wentworth instructor Arthur Goss, Jr. Picture shows Iranian students with the 1300-lb per hour cupola.—by L. Frendberg

CENTRAL INDIANA—AFS Education Director R. E. Betterley, hands chapter's award to Jack Bogaert, molding winner, International Harvester Co. Others are Joe Timbrook, Engleking Pattern Works, Columbus, Ind.; K. Horton International Harvester, Indianapolis; Jack Bresben, Engleking Pattern Works; and Jerry Chappell, International Harvester.—by William R. Patrick

Two in Mexico Chapter Responsible for Book

Two foundrymen of the AFS Mexico Chapter were responsible for the recent translation of the AFS book THE CUPOLA AND ITS OPERATION into Spanish under the title El Horno De Cubilote Y Su Operacion.

Mexico Chapter Chairman Ing. Francisco Andion, assistant technical director and plant engineer, Hierro Maleable de Mexico, S.A., Mexico City, was the translator.

Ing. Manual Goicoechea, general manager and technical director, Hierro Maleable de Mexico, S.A., and Chapter Chairman 1947-48, wrote the foreword to the book.

Publisher for the book is The Compania Editorial Continental, S.A., Calz. de Tlalpan No. 4620, Mexico 22, D.F.

Twin City Chapter

A Casting Selling Program

Design engineers expect to use 22 per cent more castings by 1965, said W. D. Gude, editor, *Foundry*.

Nine points were outlined by Gude for an efficient quality control program. These include the sectioning and checking of the first casting submitted, installing a controlled program of gating and risering, use of an effective laboratory control for sands, a program for inspecting production castings, frequent checking of casting dimensions, occasional sectioning of parts having a past history of problems, adequate non-destructive testing facility, periodic checking of pattern and flask equipment as well as gages and other inspecting equipment.

The speaker pointed out that if the foundry process involved 10 operations which were kept under control 90 per cent of the time that the good casting production would be only 62 per cent.

Three complaints were emphasized in a poll of casting buyers, quality, delivery, and price.—by Matt Granlund

Pittsburgh Chapter

Discusses Shell Cores

Profitable applications of shell cores, types of equipment, sand and resin preparations and costs were covered by G. M. Etherington, American Brake Shoe Co. Problems and solutions encountered with the process were also discussed. The AFS movie, "What's in it for You." was shown.—by C. D. Ziel

WISCONSIN—Is the customer getting what he wants? This question was discussed by J. C. Hanrahan, Northwest Engineering, H. Ruf, Grede Foundries, Inc., K. Geist, Allis-Chalmers Mfg. Co., and W. Swardenski, Caterpillar Tractor Co.—by Bob DeBoux

PHILADELPHIA—Participating in a round table meeting on the use of alloys were speaker R. A. Clark, Union Carbide Metals Co., Div. Union Carbide Corp.; coordinator R. L. Lawrence, also of Union Carbide; technical chairman C. S. Merkert, Link-Belt Co., and speakers J. R. Vogt and V. T. Popp, Union Carbide.—by Leo Houser & E. C. Klank

NORTHWESTERN PENNSYLVANIA—Vice-Chairman C. H. Bendig, speaker D. L. LaVelle, American Smelting & Refining Co., and W. Lang, ponder a problem raised by Lang.—by Walter Napp

ONTARIO—Expanding markets, good customer service, realistic pricing, and improved safety are essential for progressive foundries, stated speakers R. E. Crowe, left, and Doug Abbey, center. On right is Technical Chairman N. L. Bennett.—by P. B. Walters

PITTSBURGH—First place apprentice winners: metal pattern, Henry Mayo, Westinghouse Air Brake Corp.; steel molding, Steve Stoyle, Jones & Laughlin Steel Corp.; wood pattern, David Snee, Westinghouse Air Brake; not present, Walter Merjanovic, iron molding winner of Westinghouse.—by Walter Napp

NORTHERN CALIFORNIA — Production of ductile iron was explained by J. H. Kimes, Jr., Tennessee Products & Chemical Corp. of Texas, center. Others are Tom Ratfield, Atlas Foundry & Mfg. Co., and Michael Ginty, Vulcan Foundry.—by E. J. Ritelli

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If you are not taking advantage of the plunging technique, we would be happy to have our qualified foundry service personnel discuss this method with you. Detailed information on ductile iron and alloying techniques is presented in our brochures, **Sil-Mag Alloys for Ductile Iron** and **Plunging Sil-Mag Alloys**. A copy is yours for the asking.

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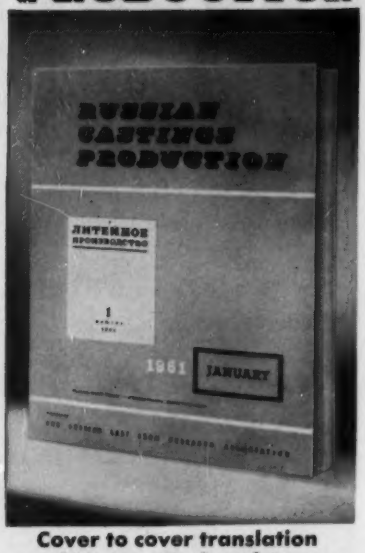
Circle No. 169, Pages 137-138

SPOTLIGHT ON RUSSIAN CASTINGS PRODUCTION



Cover to cover translation of Liteinoe Proizvodstvo.

Liteinoe Proizvodstvo is the leading Russian periodical devoted to the foundry industry. It deals with all aspects of iron, steel and non-ferrous castings production in Russia, from raw materials to finished products, including their behavior. As a service to the foundry industry on both sides of the Atlantic, the British Cast Iron Research Association is publishing a cover to cover translation of this important journal each month. If you wish to keep up to date on current Russian practice—and their fresh approach to day-to-day problems, new techniques and metallurgical investigations are of interest to every go-ahead foundryman—a year's subscription is a worthwhile investment.

FEATURED ARTICLES

- A precision casting foundry
- Scrap reduction
- High-capacity cupola blowers
- Gating systems for pressure die-castings
- Cupola operation with natural gas partly replacing coke
- Non-metallic inclusions in malleable iron.
- Stresses due to the strength of cores
- All Union conference on production of magnesium-treated high-duty irons
- The Moscow Foundrymen's Conference

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Circle No. 170, Pages 137-138

NORTHEASTERN OHIO—Chairmen at the sand symposium were: Dr. K. Bock, National Malleable & Steel Castings Co.; Charles Jelinek, Ford Cleveland Foundry; and Harry Leickly, Fanner Mfg. Co.—by Sterling Farmer

NEW ENGLAND—Principles of the cupola coke burner were outlined by Robert Carpenter, Hanna Furnace Corp., left. Others are Chapter Treasurer Thomas I. Curtin, Jr., and Herbert Smallwood, Hanna Furnace.—by J. H. Orrok

PHILADELPHIA—Shell cores—equipment and process and resin sand were explained by George Koren, Beardsley & Piper Div., Pettibone Mulliken Corp., right. Others are Technical Chairman S. B. Donner and Chairman R. C. Stokes.—by Leo Houser and E. C. Klank

TEXAS—Speaker George Di Sylvestro, American Colloid Co., Skokie, Ill., center with Chapter Chairman Edwin A. Schlotzhauer, Jr., and Technical Chairman Jake L. Maenza. Di Sylvestro spoke on hot sands.—by C. Eugene Silver

PHILADELPHIA—Three India exchange students at Bethlehem Steel Corp., R. N. Mandal, S. Janakiraman, and S. K. Mukhopadhyay, attended a recent meeting with superintendents D. E. Best and Karl Kostenbader—by Leo Houser and E. C. Klank

QUAD CITY—Apprentice night was held recently with an introduction of all apprentices who submitted entries. Shown are apprentices attending and members of the committee.—by Leo E. Osburne

Eastern Canada Chapter

Education and Foundries

How educational institutions are endeavoring to prepare students for vital roles in the foundry industry were outlined by Prof. W. Williams, McGill University, and L. Bourassa, Ecole Technique.

Both pointed out the growing trend toward specialization and how schools are attempting to train students so that they can make contributions, assume responsibilities, and gain experience in the minimum of time.—by J. Cherrett

Wentworth Institute

Iranian Mission

How a foundry and patternmaking program was initiated in Iran on limited funds was explained by Arthur Goss, Jr., former Wentworth Institute instructor who spent 26 months in that country.

Lack of funds forced reliance on local inexpensive materials. One of the projects was the construction of a cupola made from oil barrels. The oil barrel cupola melting 1300 lbs of iron per hour proved so practical that every technical school in Iran will adopt the design.

Other equipment made includes patternmaking, molding, and core benches, riddles, shovels, rammer racks, flasks, and melting equipment operated by draft, hand blowers, or electrical fans.

Goss was home on a two month leave. He was sent to Iran by the U. S. government to work on the project of industrial and economic development of Iran. A new foundry and patternshop building were furnished under his direction as well as a curriculum for training teachers in metalcasting.—by L. Frendberg

Eastern Canada Chapter

Castings and the Future

What is the theme currently guiding the destiny of the casting industry? "It is that today's aggressive foundrymen have dedicated themselves to staying constantly competitive in quality and price by making the casting process the shortest, fastest, straightest, and most reliable line between raw material and finished product," said Jack H. Schaum, editor, MODERN CASTINGS.

Schaum in an illustrated talk pointed out specific foundries and processes typical of the industry's pacesetters. —by J. Cherrett

New England Chapter

Role of Gray Iron Castings

American machine tools are in a class by themselves; much of their durability and precision manufacturing quality is due to high quality gray iron castings, stated James Meehan, formerly with Brown & Sharpe Mfg. Co.

The speaker said that the greater precision and wearing quality of American machine tools offsets the price advantage of foreign equipment. He felt, however, that U. S. tool builders and foundrymen have not capitalized on these superiorities in their sales promotion.

"The close grain and generally high quality of American castings need constant repetition to educate industry and the public to a better appreciation of gray iron casting contributions to the success of modern precision manufacturing," said Meehan.—by J. H. Orrok

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With Standard Dual Power Unit, the Permanent Mold Casting Machine That:

- Pours "two-up" with one man.
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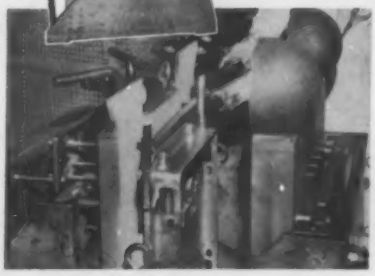

4 After preset cooling interval, machine opens and ejects casting, automatically.

Circle No. 171, Pages 137-138

CANTON DISTRICT—Gating and risering of cast irons was explained by J. F. Wallace, Case Institute of Technology, Cleveland, in an illustrated lecture. The meeting was attended by 170 foundrymen and friends from the Canton district. Chapter Chairman F. A. Dun, Babcock & Wilcox Co., Barberton, Ohio, presided and Vice-Chairman Frank P. Tobakos, Eastern Clay Products Dept., International Minerals & Chemical Corp., Wadsworth, Ohio, served as technical chairman. Shown at the speakers table are Pat Morgan, Babcock and Wilcox, speaker J. W. Wallace, Chairman F. A. Dun, and Vice-Chairman Frank Tobakos. —by Charles Stroup

CENTRAL INDIANA—Foundrymen present for the annual Student Night were Dick Gehres and Joe McAuliffe, Golden Foundry Co., Columbus, Ind.; Sam Hodler and William Grimes, Gartland Foundry Co., Terre Haute, Ind.; and Sam Johnson, International Harvester Co., Indianapolis. During the day students toured the International Harvester plant.—by William R. Patrick

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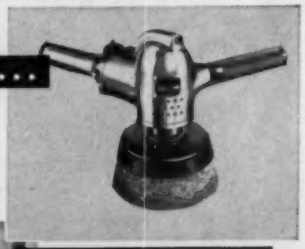

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Circle No. 172, Pages 137-138

Southern Tier Section

Elect New Officers

Officers for the Southern Tier Section of the Central New York Chapter have been named for the 1961 season. Those elected are:

Chairman, W. G. Parker, General Electric Co., Elmira, N. Y.; treasurer, Louis Wallitt, Kennedy Valve Mfg. Co., Elmira, N. Y.; secretary, M. Brady, Ingersoll-Rand Co., Painted Post, N. Y. Directors are Fred Kuster, Ward Casting Co., Blossburg, Pa.; and past chairman I. Niles Kitchen, Ingersoll-Rand Co.

N. P. Lillybeck, Modern Equipment Co., discussed the metallurgical aspects of the cupola in an illustrated talk. Closer control of temperature at the spout and melting rates were emphasized for improving scrap reduction.—by F. H. Troy

Central New York

New Ideas Night

Three former Central New York chairmen or directors discussed foundry problems in three major areas. Bruce Artz covered casting cleaning, Robert Thurston outlined the latest in materials handling, and Ralph Denton highlighted refractory materials. Speakers emphasized how the latest technology could be applied specifically to foundries in the central New York area.—by Anthony F. Izzo

Ontario Chapter

Safety, Customer Service

A realistic cost program set in motion before the customer's order is accepted is the prime requisite of good customer service, said R. E. Crowe, Crowe Foundry, Ltd. Such a detailed study, he stated, would lead to better castings at a lower price, better patterns, and a technical approach to the manufacture of gray iron.

Also important is understanding the customer's problems and acting in the design stage to lower end use costs, even with a higher initial price, pointed out Crowe.

Doug Abbey, Industrial Accident Prevention of Ontario, pointed out that accidents in the Ontario area cost industry about $1,000,000 weekly. He recommended creation of safety attitudes, installation of a thorough accident prevention program, and plans for any emergency. He stated an accident can happen anywhere, no matter how safe conditions appear and reminded management that it must set good examples.—by P. B. Walters and T. H. Slater

TRI-STATE—Improving foundry sand practices were discussed by John P. Laux, Jr., M. A. Bell Co. He stressed maintaining a uniform grade of sand for each purpose.—by Bobby Bell

QUAD CITY—Pneumatic material handling was explained by George W. Anselman, Anselman Foundry Services, St. Charles, Ill. Clifford Erikson, Frank Foundries Corp., Chapter Chairman, presided. Dave Gilchrist, Deere & Co., was technical chairman.—by Leo E. Osbourne

CENTRAL INDIANA—AFS National Director R. R. Deas, Jr., checks entries in the chapter's apprentice contest.—by William R. Patrick

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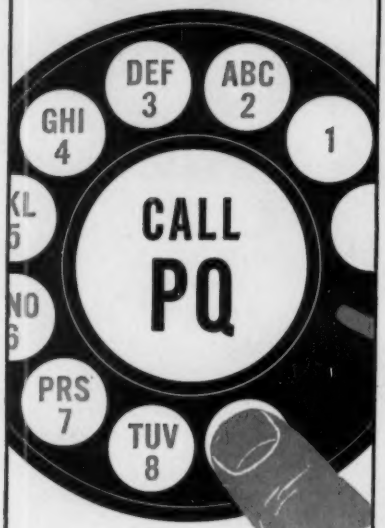

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CHICAGO—George Koren, Beardsley & Piper Div., Pettibone Mulliken Corp., discusses shell molding and coring equipment.—by George DiSylvestro

ST. LOUIS—Technical Chairman L. C. Farquhar, East St. Louis Castings Co., welcomes speaker C. J. Turner, Caterpillar Tractor Co., who spoke on pattern design as it relates to increased production. Sign in background announces the Missouri Regional Conference to be held Sept. 21-22 at Rolla, Mo.—by W. E. Fecht

WESTERN MICHIGAN—A. E. Jacobson, Jr., and Sr., Grand Haven Brass Co., Grand Haven, Mich., were hosts recently to a tour by chapter members.—by J. L. Brooks

CHICAGO—Dean Trezise, University of Illinois, outlines the role of industry and education in addressing chapter members and students. Two F.E.F. scholarships were awarded.—by George DiSylvestro

PHILADELPHIA—Attending a recent meeting from Marietta, Pa., were Cy Donner and Bruce Hoffman of Donegal Steel Castings.—by Leo Houser and E. C. Klank

NORTHEASTERN OHIO—John A. Sharritts, J. A. Sharritts Co., technical chairman of the ferrous division meeting and speaker Harold Schwengel, Modern Equipment Co., Port Washington, Wis.—by Sterling Farmer

NORTHEASTERN OHIO—O. W. Street, Parker Street Castings Co., Chapter Director, with Ken Wagner, Grafton Foundry Co., technical chairman of the non-ferrous division meeting.—by Sterling Farmer

CENTRAL INDIANA—Attending a recent chapter meeting are Joe Srebalus, E. A. Kinsey Co., and Walter Wingenroth, National Malleable & Steel Castings Co., Indianapolis.—by William R. Patrick

Northeastern Ohio

Holds Simultaneous Sessions

Patternmaking, ferrous, and nonferrous sessions were held at a recent meeting. Patternmakers heard a panel discussion on "The Technician in the Patternshop" by William P. Hoffman, principal, Max S. Hayes Trade School, Cleveland; Nicholas R. Rimboi, director of the technical institute, Fenn College, Cleveland; and George A. Purdy, Aluminum Co., Cleveland. Donald C. Hartman, Cove Pattern Works, Inc., was moderator.

New developments in water-cooled cupolas were discussed at the ferrous session by Harold W. Schwengel, Modern Equipment Co., Port Washington, Wis. He explained the major differences between this type and the conventional cupola.

Non-ferrous foundrymen heard William H. Clarke, Reynolds Metals Co., Richmond, Va., speak on high-strength aluminum castings. He said that expanding use of aluminum castings is expected to continue as a result of new properties and development of new alloys. Clarke stated that high-silicon alloys, which are not new but have had limited use because they present problems in use, are likely to find greater applications. Various new alloys were also outlined.—by Edwin Bremer, Jack C. Miske, and Wallace D. Huskonen.

Utah Chapter

Aluminum Melting Practice

Purchase of clean metal, combined with proper ladling and melting will greatly aid in reducing aluminum metal losses, said Ray P. Dunn, Lindberg-Fisher Div., Lindberg Engineering Co., Chicago.

Among topics discussed were use of fluxes, melting temperatures, feeding ranges, and refractories. Various melting equipment types were also covered including crucibles, the new radiant-wall furnace, electric-resistant type, resistant tiling, type, the reverberatory, and the induction furnace.—by J. M. Bushnell

PHILADELPHIA—Long distance visitors to the regular monthly meeting are Al Johnson and Erik Mogensen, Donegal Steel Castings Co., Marietta, Pa.—by Leo Houser & E. C. Klank

San Antonio Section

Heat Treating Sessions

Heat treating of steel, cast iron, ductile iron, and aluminum were presented by Edwin Lynn, Kincaid-Osburn Steel Castings, Inc., and Charles McGrail, Alamo Iron Works.

Lynn discussed three ways of tempering steel castings which were air tempered and outlined each process. McGrail spoke on the techniques of heat treating cast iron, ductile iron, and aluminum. Both speakers emphasized that the high and low degrees are the critical points in the heat treating process.—by Frank E. Page

Central Illinois

Gating and Risering

Development and application of gray iron gating and risering procedures were explained by H. O. Meriwether, Jr., Lynchburg Foundry Co., Lynchburg, Va.

He outlined systems based on known principles of fluid flow with risering based on heat transfer fundamentals. Formulas were developed for both gating and risering. Meriwether stressed that if a scientific approach were taken that memory and guesswork would be eliminated.

Chapter Chairman Clarence J. Turner, Caterpillar Tractor Co., presided at the meeting attended by 104. Ray Heiden, Galva Foundry Co., served as technical chairman. Names were by the nominating committee for officers and directors for the coming year.—Charles W. Search

NORTHWESTERN PENNSYLVANIA—Speaker Lester B. Knight, Lester B. Knight & Associates, left, confers with Ray Robertson, Erie City Iron Works, and R. W. Somers, Whitehead Bros.—by Walter Napp

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Circle No. 175, Pages 137-138

Texas Chapter

Hears Hot Sand Talk

Hot sands are both a direct and indirect cause of many casting defects, George DiSylvestro, American Colloid Co., Skokie, Ill., told Texas foundrymen.

He emphasized that hot sands set in motion a chain of reactions which are difficult to control. They occur because of an inadequate amount of sand in the system relative to the amount of metal poured or/and lack of proper sand handling and storage facilities. The higher the metal to sand ratio, the more rapidly hot sands develop, stated the speaker.

DiSylvestro pointed out that methods used to cool hot sands frequently compound the problems. Excessive additions of water and air to reduce sand temperatures can upset the basic fundamentals of the sand system. Where hot sands exist and a solution is sought by mechanical means, a reliable engineering source should be consulted.

The speaker pointed out that when excessive water is applied to hot molding sand, the temperature is reduced to steam temperature. Bodies of hot sand tend to retain and not dissipate heat. Sands that reach the muller at temperatures above 212 F. may consume gallons of water in order to reduce the temperature. If steam is not removed by air applied at the muller, the heat-saturated sand can result in an epidemic of defects.

DiSylvestro observed that steam-soaked sand mixtures create adverse molding conditions. Mold-metal turbulence may result, which in turn can cause several difficulties such as loose sand being carried into the castings. Hot sands promote spalling which is a direct source for inclusions and pinhole porosity. Steam and inclusions are responsible for hydrogen absorption in the metal. Brittle sands and hot sands are generally synonymous. Foundries with too short mulling cycles frequently develop hot, brittle sands. These brittle sands tend to spall, scab, erode, and are more susceptible to sand expansion defects.

The speaker recommended to offset the effect of short mulling cycles, further additions of celulose products, bonds and other fines. Although this adds to the cost, savings obtained by the reduction of certain of these additions could in many cases pay for cooling devices, additional storage binds, or mullers.

Foundries plagued with hot sands, but reluctant to increase sand capacity, would better off if they added naturally-bonded sands to the system, said DiSylvestro. Naturally-bonded sands do not require increased mulling since they possess some strength when added to the sand mixture. Where a large addition of core sand enters the system, at times it taxes mulling capacity to handle the rebonding of these clay-free sand grains. Where hot sands are present, it is impossible to properly rebond new core sand entering the system with a shortened mulling cycle, said the speaker.—by C. Eugene Silver

Detroit Chapter

Pattern Requirements Today

Greater cooperation is needed between designers, patternmakers, and foundrymen pointed out Ray Olson, Southern Precision Pattern Works, Birmingham, Ala.

He stated that many jobs could be simplified and tooling costs reduced through a coordinated effort. In an illustrated talk he showed how his company has attempted to reduce tooling costs by interchangeable patterns and core equipment.

Chapter pattern contest winners were announced. First place in wood patternmaking was won by O. A. VanSickle, and Ronald Czinki won the wood patternmaking honors. Both are with Progress Pattern Co.

Roger VanDerKar, Hanna Furnace Co., Chapter Chairman, presided at the meeting attended by 135 members and guests. Chris Zanison, C&S Products was program chairman.—by J. H. Barron, Jr.

Connecticut Chapter

Sponsor Spring Seminar

The chapter's annual Spring Seminar was conducted recently at Yale University using the theme "Foundamentals of Foundry Metallurgy".

Arthur Avedesian, Taylor & Fenn Co., Windsor, Conn., was the leader at the ferrous sessions. Non-ferrous sessions were conducted by Robert F. Schmidt, H. Kramer & Co. and D. L. LaVelle, American Smelting & Refining Co. Frank Hoffman, Connecticut Foundry, was chairman at a panel discussion in which Schmidt and LaVelle participated. Stephen LeRoy, Connecticut Coke Co., was arrangements chairman.—by Frank M. Stratton

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Circle No. 176, Pages 137-138

Foundry Trade News

Steel Founders' Society of America . . . presented four awards for outstanding achievements at its annual meeting. Winners were: Frederick A. Lorenz Medal, J. D. Hagans, Ohio Steel Foundry Co. plant, Springfield, Ohio; Technical & Operating Medal, Dale L. Hall, Oklahoma Steel Castings Co., Tulsa, Okla.; Gustav A. Lillieqvist Steel Foundry Facts Award, O. W. Kramer, Columbia Steel Casting Co., Portland, Ore., and W. A. Snyder, associate professor, University of Washington, Seattle, Wash., for their technical paper "The Use of Olivine Sands for Molds and Cores." Second place honors were won by T. S. Quinn, Jr., Lebanon Steel Foundry, Lebanon, Pa., for "Pressure Pouring of Steel Castings."

Speakers and their subjects were: Dale Hall, a review of the technical and operating progress of the industry; Jack B. Caine, consultant, "Steel Castings Design for the Future;" Frank G. Steinebach, Foundry magazine, "The Next Ten;" Dr. Pierre Rinfert, Lionel D. Edie & Co., "The Future is Your Business;" J. D. Holtzaple, Blaw-Knox Co., "Tremendous Trifles;" Willard V. Merrihue, General Electric Co., "A Blueprint for Businessmen in Politics—Post 1960;" Bertrand J. Belda, Ernst & Ernst, "Profitable Pricing for Foundry Products;" and Robert Kazmayer, publisher, "American Business in the Months Ahead."

Malleable Founders Society . . . recently held its Technical and operating conference in Cleveland. Speakers included: Dorian Shainin, Rath & Strong, who discussed cost reduction through statistical analysis; Charles H. Ker, Dalton Foundries, Inc., who spoke on the supervisor's role on the management team; George F. Sommer, Link-Belt Co., who with Shainin and Ker discussed the society's basic property research at Purdue University.

Other speakers and their subjects: Victor Rowell, Archer-Daniels-Midland Co., furfural resins and Prof. J. F. Wallace, Case Institute of technology, gating and risering. A panel composed of Nick Jacobs, Albion Malleable Iron Co., R. James Crites, Chicago Railway Equipment Co., and L. K. Vollenweider, Deere & Co., discussed joining methods.

Rezolin, Inc. . . . has recently moved to expanded facilities at 35640 S. Gratiot Ave., Mt. Clemens, Mich., a suburb of Detroit.

Ohio Ferro-Alloys Corp. . . . Canton, Ohio, has been named by Foote Mineral Co. as its U. S. agent for electrolytic manganese metal to the foundry trade and to secondary brass and aluminum smelters.

Berkshire Chemicals, Inc. . . . New York, has been acquired by its president, Malcolm H. McAllister, from the parent, Vitro Corp. of America.

Foseco, Inc. . . . is the new corporate style for Foundry Services, Inc., Cleveland. There is no change in corporate operation except internal reorganization creating a Foundry Products Div. and a Steel Mill Products Div.

Firstunited Corp. . . . Los Angeles, in a recent stock purchase arrangement, involving a total consideration of near $1,000,000, gained controlling

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Circle No. 181, Pages 137-138

interest in Union Die Casting Co., Whittier, Calif. B. Sherman Green, formerly U.D.I.C. marketing vice president, is president.

Sibley Machine & Foundry Co. . . . South Bend, Ind., has been awarded a citation for its accident prevention program by the South Bend Chamber of Commerce. The company was cited for its 405 days and 480,000 man-hours without a lost-time accident as of March 1.

International Nickel Co. . . . and Meehanite Corp., have concluded an agreement for the manufacture in the United States of magnesium bearing spheroidal graphite cast iron. Meehanite has acquired the right to grant sublicences to foundries in its group for production of the metal under patents owned by International Nickel.

Mace, Inc. . . . Jacksonville, Fla., will represent Harcast Co., Inc., Glenolden, Pa., in Florida, Georgia, South Carolina, Tennessee, and Alabama for the sale of ferrous and non-ferrous investment castings.

AFS
Chapter Meetings

Texas . . San Antonio Section . . May 23 . . Alamo Iron Works, San Antonio, Texas . . *Election of Officers* and F. Page, Alamo Iron Works, *"Care of Pattern Equipment."*

Tri-State . . May 12 . . Ramada Inn, Tulsa, Okla.

Birmingham District . . May 19 . . Thomas Jefferson Hotel, Birmingham, Ala. . . Panel Discussion: *"What Are We Doing With Ductile Iron?"*

Central Illinois . . June 10 . . 497th Engineers, Peoria, Ill. . . *Annual Clambake and Bar-b-Que.*

Chesapeake . . May 26 . . Business Meeting and Visitation to Western Electric Company, Baltimore, Md.

Connecticut . . May 23 . . Indian Hill Country Club, Newington, Conn. . . R. B. Sinclair, Roger B. Sinclair Associates, *"Costing and Cost Control Methods In Foundry Operations".*

Detroit . . May 18 . . Wolverine Hotel, Detroit . . Panel Discussion: *"Aluminum or Iron—Which Shall it Be?"*

Eastern Canada . . May 12 . . Annual Business Meeting, Presentation of Winning Entries Chapter Paper Writing Contest.

Mid South . . May 12 . . Hotel Claridge, Memphis, Tenn. . . *Election of Officers.*

Mo-Kan . . May 18 . . Fairfax Airport, Kansas City, Kan. . . Chief C. E. Buis, Kansas City Fire Dept., *"Civil Defense."*

Northeastern Ohio . . May 18 . . Manger Hotel, Cleveland . . *Recognition Night.*

Northern Illinois & Southern Wisconsin . . June 10 . . Morse Hills Golf Club, Beloit, Wis. . . *AFS Annual Picnic.*

Northwestern Pennsylvania . . May 22 . . Amity Inn, Erie, Pa. . . J. O. Trimble, The Budd Co., *"Nickle Plating Process For Pattern Production."*

Ontario . . May 12 . . Royal Connaught Hotel, Hamilton . . C. J. MacFayden, Canadian General Electric Co., *"Cost Reduction—A Passport To Survival."*

Philadelphia . . May 12 . . Engineers' Club . . Philadelphia . . W. C. Wheadon, Syracuse University Research Institute, *"Non Destructive Testing Methods."*

Quad City . . May 15 . . LeClair Hotel, Moline, Ill. . . W. Story, Institute of Scrap Iron And Steel, *"Scrap Is A Raw Material."*

Saginaw Valley . . June 3 . . IMA Lodge, Potters Lake, Flint, Mich. . . *Annual Outing.*

Southern California . . May 19 . . Rodger Young Auditorium, Los Angeles . . Lt. Col. W. O'Brien, U. S. Army, *"Man in Capsule."*

Tennessee . . May 19 . . Wimberly Inn, *Chattanooga, Tenn. . . Quiz Program and Installation of Officers.*

Texas . . June 10 . . Fredonia Hotel, Nacogdoches, Texas . . *Dinner Dance.*

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INDUSTRIAL ENGINEERING
WAGE INCENTIVE
METHODS—PROCEDURES
PRODUCTION CONTROL
COST SYSTEMS

Circle No. 186, Pages 137-138

DIETERT DETROIT

automation equipment for production sand systems

Sand, Core, Shell and Mold Testing Equipment

CARBON and SULFUR DETERMINATORS

DIETERT DETROIT

DIETERT DETROIT

HARRY W. DIETERT CO.
9330 ROSELAWN AVE.
DETROIT 4, MICHIGAN

Circle No. 187, Pages 137-138

IT SHOULDN'T be surprising to you that someone has been able (at long last) to closely control the specifications of shot and grit. And if you are willing to accept this statement as a fact—the door suddenly opens to substantial reductions in your *cleaning room costs!*

National Metal's **Permabrasive®** cleans 20% faster and costs less than steel. This can either mean a big savings in time, or a big savings in power, if you can't use more speed. Add savings in maintenance to lower costs per ton over steel abrasives and you have reduced your cleaning room costs, which are a part of the cost of your product.

You may be interested in **New Controlled "T"®**, a half a ton of which does the work of a full ton of ordinary chilled iron abrasives; or in **Perma-Steel®** that lasts as long and cleans as well as steel at a much lower cost! But one thing is sure: If you give these abrasives with controlled characteristics the controlled use they deserve, your surprise will be a pleasant one. Write for free booklet: "The Facts of Life Concerning the Use of Shot and Grit."

NATIONAL METAL ABRASIVE COMPANY
3560 NORTON ROAD • CLEVELAND 11, OHIO

Western Metal Abrasives Co. (affiliate) 101 E. Main Street, Chicago Heights, Ill.

Sold Exclusively by
HICKMAN, WILLIAMS & CO., INC.
Chicago • Detroit • St. Louis • New York
Cincinnati • Cleveland • Philadelphia
Pittsburgh • Indianapolis

Exclusive Subdistributors
BRUMLEY-DONALDSON COMPANY
Los Angeles • Oakland • Seattle
THE FOUNDRY SUPPLY CO., INC.
Minneapolis

Circle No. 185, Pages 137-138

Future Meetings and Exhibits

May 3-4 . . The Iron and Steel Institute Annual Meeting, Institution of Mechanical Engineers, London, England.

May 8-12 . . AFS 65th Castings Congress, Sheritan-Palace Hotel, San Francisco.

May 9-11 . . Material Handling Institute, Eastern States Show. Convention Hall, Philadelphia.

May 10-12 . . National Industrial Sand Association, Annual Meeting. The Homestead, Hot Springs, Va.

May 17-19 . . Society For Nondestructive Testing, Eastern Regional Convention, Sheraton-Mt. Royal Hotel, Montreal, Que. Canada.

May 17-19 . . American Institute of Mining & Metallurgical Engineers, First Conference on Management of Materials Research, Arden House, Harriman, N. Y.

May 22-25 . . American Society of Mechanical Engineers, Conference and Design Engineering Show, Cobo Hall, Detroit.

May 22-26 . . American Society of Tool and Manufacturing Engineers. Engineering Conference and Exhibit, New York.

June 6-8 . . University of Michigan, Second Congress on Environmental Health, University of Michigan, Ann Arbor, Mich.

June 8-9 . . Malleable Founders Society, Annual Meeting. The Broadmoor, Colorado Springs, Colo.

June 11-15 . . 54th Annual Air Pollution Control Association Meeting, Hotel Commodore, New York City.

June 15-16 . . AFS Chapter Officers Conference. LaSalle Hotel, Chicago.

June 18-20 . . Alloy Casting Institute, Annual Meeting, Hot Springs, Va.

June 18-24 . . 28th International Foundry Congress, Vienna Imperial Castle, Vienna, Austria.

June 20-21 . . Investment Casting Institute Technical Course, Case Institute of Technology, Cleveland, Ohio.

June 22-24 . . AFS Penn State Regional Foundry Conference. Penn State University, University Park, Pa.

June 25-30 . . American Society for Testing Materials, Annual Meeting. Chalfonte Haddon Hall, Atlantic City, N. J.

July 18-20 . . Western Plant Maintenance & Engineering Show, Pan Pacific Auditorium, Los Angeles.

Aug. 28-Sept. 1 . . American Society of Mechanical Engineers, International Heat Transfer Conference, University of Colorado Campus, Boulder, Colorado.

Sept. 3-8 . . American Chemical Society, Fall Meeting. Chicago.

Sept. 20-23 . . American Ceramic Society, Enamel Division, French Lick-Sheraton Hotel, French Lick, Ind.

Let's Get Personal . . .

Carl F. Joseph . . . is now a consultant with Miller & Co., Chicago. Joseph was formerly technical director of Central Foundry Div., General Motors Corp. until his retirement.

James H. Smith . . . general manager, Central Foundry Div., General Motors Corp., since the formation of the division in 1946, has retired after a 46-year career. He is a past president of the Malleable Founders' Society and the Foundry Educational Foundation. Smith holds the Malleable Founders' Charles H. McCrea Medal and the AFS Peter L. Simpson Gold Medal . . . "for outstanding contributions to the application of engineering principles in foundry practice." He was also an AFS National Director.

Elmer E. Braun . . . succeeds James H. Smith as general manager; Central Foundry Div., GMC. Other changes: **Carl A. Koerner,** divisional works manager; **Charles E. Drury,** divisional director of sales and engineering; **Thomas R. Wiltse,** divisional director of reliability; **Thomas E. Smith,** plant manager, Defiance, Ohio, plant; **Dale W. Wonus,** plant manager, Danville, Ill., plant.

Dr. James A. Crookston . . . appointed director of research, A. P. Green Fire Brick Co. He will direct research activities for all products and plants within the Green organization. **Floyd M. Maupin** named as director of engineering.

A. H. Ciaglia . . . promoted to chief technical engineer, eastern division, G. E. Smith, Inc., Pittsburgh, Pa.

Robert J. Murphy . . . named foundry superintendent, LFM Mfg. Co., subsidiary of Rockwell Mfg. Co. **James S. Turner** named as manager, production control and purchasing.

Bruce Walker . . . now general manager, Electro Minerals Div., Carborundum Co., Niagara Falls, N. Y., succeeding **Joseph S. Imirie** now assistant secretary of the U. S. Air Force for Material. **Dr. Donald W. Gillmore** succeeds Walker as manager of the division's technical branch.

Edward J. Ankuda . . . is now general manager, Vermont Foundries, Inc., Springfield, Vt., and **Nancy V. Bathegate** is treasurer.

David Miller . . . is now industrial sales representative for upstate New York for the Industrial Div., Corn Products Sales Co. He will headquarter at Albany, N. Y.

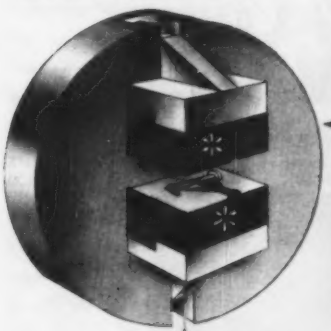
Alexander C. Andrew . . . is now superintendent, gray iron operations, Springfield Foundry Co., Indian Orchard, Mass.

Walter Luther . . . named to newly created position of materials manager, at the home office of Perfect Circle Corp., Hagerstown, Ind.

Vincent D. Bates . . . is now factory manager, Oberdorfer Foundries, Inc., Syracuse, N. Y.

Edward B. Pilcher . . . named general works manager for National Carbon Co., Div., Union Carbide Corp. He will be responsible for all produc-

Make Holding Fixtures Quickly / Easily with EPOCAST



- Absorbs Inertia
- Eliminates Tool Chatter
- Compensates For Casting Variance
- Accurate
- Fast
- Protects Parts From Marring
- Inexpensive

*EPOCAST is an ideal material for making holding fixtures such as the plastic chucking jaws shown here. It casts in three simple steps. Sets tack free in 2 to 4 hours. Ready for use in 24 hours or less. Makes tooling easier. Send now for technical bulletin giving full information on making chucking jaws.

furane plastics INCORPORATED

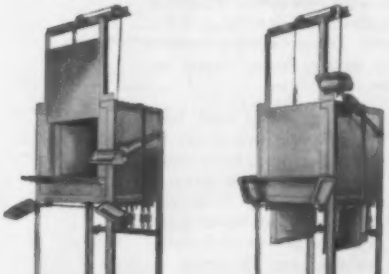
4516 Brazil St., Los Angeles, California CHapman 5-1151 / 42 Chasner Street, Hempstead, Long Island, N. Y. IV 3-6246

Circle No. 184, Pages 137-138

New SAUNDERS Shell Investment Mold FURNACE

. . . provides maximum operator convenience
. . . occupies minimum floor space

Gas fired to 1800°F. — equipped with Indicating Pyrometer — Counter-weighted Front and Drop-Bottom Trapdoors — Occupies just 46" x 46" of Floor Space — Ample Firing Chamber, 18" x 18" x 18"



Front door raised to load shell investment molds for firing. Cable and pulley counter-weight mechanism built close to side wall.

Side-hinged trapdoors lowered to let molten wax run into water filled collecting pan.

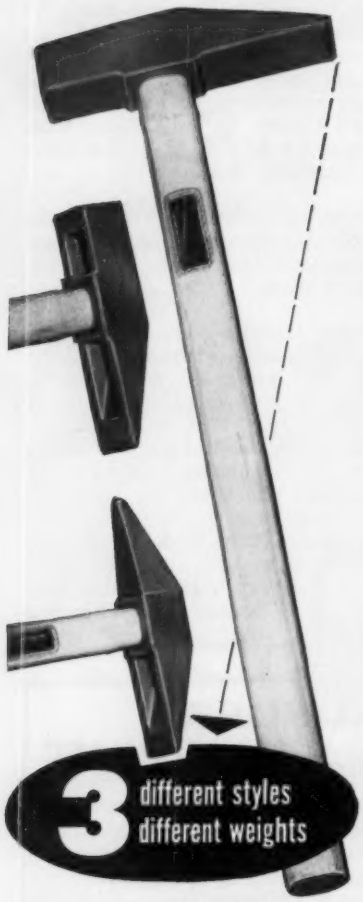
Write Today For Information!

Alexander Saunders & co., INC.
95 Bedford Street, New York 14, N. Y.

Circle No. 183, Pages 137-138

CUPOLA PICKS

Now Available at Industrial



It never pays to use makeshift tools for cupola work. Industrial's Cupola Picks are designed for the job by people who know foundry needs. They do it better, faster—keep replacement costs down.

These rugged, well balanced picks are made of nickel/chrome/moly steel, heat treated to proper hardness, with face and edges ground. Select quality, straight grain hickory handles are 23" long.

Write Factory or ask your Foundry Equipment Dealer for descriptive literature.

Industrial
EQUIPMENT COMPANY
271 Ohio Street, Minster, Ohio

Circle No. 188, Pages 137-138

tion activities of National Carbon which has plants in Cleveland and Fostoria, Ohio; Clarksburg, W. Va.; Columbia and Lawrenceburg, Tenn.; and three plants in Niagara Falls, N. Y.

Anton Dorfmueller, Jr. . . . appointed as division manager, Federal Foundry Supply Div., Archer-Daniels-Midland Co., Cleveland.

Robert L. Williams . . . elected vice-president, marketing division, Lester B. Knight & Associates, Inc., Chicago.

Hugh V. Boemer . . . is now sales manager, GLC Meltstock Div., Great Lakes Carbon Co., St. Louis.

Mahlon E. Wood . . . appointed market development engineer, American Zinc Institute, New York.

obituaries

James Bathgate, president, Vermont Foundries, Inc., Springfield, Vt.

E. Drolet, La Cie Foundrie Drolet, Ltd., Quebec, Canada, one of the oldest members of the Eastern Canada Chapter.

William T. Welch, 71, chairman of the board, Ajax Flexible Coupling Co., Westfield, N. Y. He and his father, Dr. C. E. Welch, were co-founders of Ajax Co. in 1920.

E. L. Asbury, who retired from Central Foundry Co. in Sept., 1960.

Walter I. Golden, 79, founder and chairman of the board, Golden Foundry Co., Columbus, Ind. He started in Columbus as a molder in 1901 and in 1915 he and four partners founded the Columbus Foundry Co. In 1924 he founded Golden Foundry Co. and served as president until 1956 when he became chairman of the board. He had been active in the Indiana State Chamber of Commerce and was vice-president and a director of that association.

John B. Frielingsdorf, president, Banner Iron Works, St. Louis. A son of one of the founders of the foundry and steel fabricating concern, he had been associated with the company all his adult life and was its president the last 12 years.

SCIENTIFIC
PRESSURE CAST
MATCHPLATES

CHECKED FOR QUALITY
7 WAYS

Inspected at 7 points of manufacture for highest possible matchplate quality . . . Scientific is the only producer using patented new Fortschneider Shift Indicator.

THE SCIENTIFIC CAST PRODUCTS CORP.
1390 East 40th Street • Cleveland 3, Ohio

Circle No. 194, Pages 137-138

LITERATURE REQUEST SERVICE

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Sand Handling Equipment	108
Silvery Pig Iron	20
Shell Core Molding Machine	21
Silicon Alloys	66
Temperature Measuring Equip.	144
Testing Equipment	119, 134
Vibrating Equipment	28, 79
Zircon	67

Yours . . . For Advancing Metalcasting

This month . . . a double-barreled feature, the Exhibition-in-Print section, beginning on page 91, and the Suppliers' Directory, page 139, combine to offer you information that will aid in building metalcasting profits.

The comprehensive list of products and services on this page also function as a guide to the MODERN CASTINGS advertisers who have carefully prepared important material on each of these topics to help advance your metalcasting practices.

Use the Reader Service Card below to learn more about the products and processes in Exhibition-in-Print or on the advertising pages. All of the participating manufacturers and suppliers have expressed a personal invitation to the readers to take advantage of this valuable service.

MAY 1961—1 Valid through July 1961

EXHIBITION-IN-PRINT										ADVERTISED PRODUCTS							
1	13	25	37	49	61	73	85	97	109	121	133	145	157	169	181	193	205
2	14	26	38	50	62	74	86	98	110	122	134	146	158	170	182	194	206
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5	17	29	41	53	65	77	89	101	113	125	137	149	161	173	185	197	209
6	18	30	42	54	66	78	90	102	114	126	138	150	162	174	186	198	210
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9	21	33	45	57	69	81	93	105	117	129	141	153	165	177	189	201	213
10	22	34	46	58	70	82	94	106	118	130	142	154	166	178	190	202	214
11	23	35	47	59	71	83	95	107	119	131	143	155	167	179	191	203	215
12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216

Please Print and Fill Out Completely to Validate Your Requests

Name

Position

Company

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No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
First Class Permit No. 83, Sec. 34.9 P. L. & R.
DES PLAINES, ILL.

Reader Service Dept.
MODERN CASTINGS
Golf and Wolf Rds.
Des Plaines, Ill.

Yours . . . For Advancing Metalcasting

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MAY 1961—2

Valid through July 1961

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Shell Core Molding Machine	21
Silicon Alloys	66
Temperature Measuring Equip.	144
Testing Equipment	119, 134
Vibrating Equipment	28, 79
Zircon	67

SUPPLIERS' DIRECTORY of Modern Castings Advertisers 1961

A handy alphabetical reference guide to products, processes, and services offered by leading manufacturers in the metalcasting industry. All of the companies listed here have displayed their products on the pages of Modern Castings *during 1961. Manufacturers' names and addresses as well as detailed and valuable information can be found in the Special Exhibition-in-Print feature beginning on page 91.*

ABRASIVES, BLASTING

Carborundum Co.
Hickman, Williams & Co.
Metal Blast, Inc.
National Engineering Co.
National Metal Abrasive Co.
Pangborn Corp.
Pennsylvania Glass Sand Corp.
Alexander Saunders & Co.
Walker Peenimpac Machine Mfg. Div. Walker Pump Co.
Wedron Silica Co.
Wheelabrator Corp.

ALUMINUM ALLOYS

Alloys & Chemicals Corp.
American Smelting & Refining Co.
Olin Mathieson Chemical Corp.
Vanadium Corp. of America
WaiMet Alloys Co.

BORON ALLOYS

Vanadium Corp. of America

BOTTOM AND PRESSER BOARDS

Adams Co.

BRONZE ALLOYS

American Smelting & Refining Co.

CALCIUM ALLOYS

Union Carbide Metals Co., Div. Union Carbide Corp.

CALCIUM-SILICON

Ohio Ferro-Alloys Corp.
Union Carbide Metals Co., Div. Union Carbide Corp.

CARBON & GRAPHITE PRODUCTS

National Carbon Co., Div. Union Carbide Corp.

CARBON SAND

Great Lakes Carbon Co.
Humble Oil & Co.

CHILLS, CHAPLETS, NAILS

Archer-Daniels-Midland Co. Federal Foundry Supply Div.
Fanner Mfg. Co.

CHROMIUM ALLOYS

Ohio Ferro-Alloys Corp.
Union Carbide Metals Co., Div. Union Carbide Corp.
Vanadium Corp. of America

CLEANING ROOM EQUIPMENT & SUPPLIES

Pangborn Corp.
Walker Peenimpac Machine Mfg. Div. Walker Pump Co.
Wheelabrator Corp.
Whiting Corp.

COLUMBIUM ALLOYS

Vanadium Corp. of America

COKE

Alabama By-Products Corp.
Alan Wood Steel Co.
DeBardeleben Coal Corp.
Hickman, Williams & Co.
Koppers Company, Inc. Gas & Coke Div.
Pickands Mather & Co.
Pittsburgh Coke & Chemical Co.
Semet-Solvay Div., Allied Chemical & Dye Corp.

CONSULTING SERVICES

Carver Foundry Products
Chas C. Kawin Co.
Lester B. Knight & Associates, Inc.
D. C. Latella & Associates, Inc.
Modern Equipment Co.
National Engineering Co.
Stahl Specialty Co.
Whiting Corp.

CONTAINERS, PALLETS & BOXES

Wirebound Box Manufacturers Association

CONVEYORS

National Engineering Co.
Simplicity Engineering Co.
Syntron Co.

CORE & MOLD BLOWERS & SHOOTERS

Beardsley & Piper Div. of Pettibone Mulliken Corp.
Carver Foundry Products
Shalco Div., National Acme Co.

CORE PASTES

Archer-Daniels-Midland Co. Federal Foundry Supply Div.
Frederic B. Stevens, Inc.

CORE PLATES

Adams Co.
Shalco Div., National Acme Co.

CO_2 EQUIPMENT

Carver Foundry Products
General Dynamics, Liquid Carbonic Div.

CO_2 GAS

General Dynamics Corp., Liquid Carbonic Div.

CRUCIBLES

Brown Boveri Corp.
Crucible Manufacturers' Assn.
Great Lakes Carbon Corp.
National Carbon Co., Div. Union Carbide Corp.
Alexander Saunders Co.
Frederic B. Stevens, Inc.

CUPOLAS

Great Lakes Carbon Corp.
Modern Equipment Co.
Whiting Corp.

CUPOLA ACCESSORIES

Modern Equipment Co.
National Carbon Co., Div. Union Carbide Corp.
Whiting Corp.

DEOXIDIZERS, DEGASSERS, GRAIN REFINERS

Carborundum Co.
Foseco, Inc.

DUST & FUME CONTROL EQUIPMENT

Pangborn Corp.
Walker Peenimpac Machine Mfg. Div. Walker Pump Co.
Wheelabrator Corp.

EXOTHERMICS

American Colloid Co.
Foseco, Inc.
Ohio Ferro-Alloys Corp.
Frederic B. Stevens, Inc.
Union Carbide Metals Co., Div. Union Carbide Corp.
Vanadium Corp. of America

FERRO-ALLOYS

Hickman, Williams & Co.
Keokuk Electro-Metals Co. Div. of Vanadium Corp. of Amrica
Molybdenum Corp. of America
Ohio Ferro-Alloys Corp.
Pickands Mather & Co.
Union Carbide Metals Co., Div. Union Carbide Corp.
Vanadium Corp. of America
WaiMet Alloys Co.

FILM, FILM PROCESSING, DARKROOM EQUIPMENT

Eastman Kodak Co.

FLASKS & JACKETS

Adams Co.
American Foundry Flask Co.
Archer-Daniels-Midland Co. Federal Foundry Supply Div.
Hickman, Williams & Co.
Hines Flask Co.
Sterling National Industries

FLUXES

Alloys & Chemicals Corp.
American Smelting & Refining Co.
Cleveland Flux Co.
Foseco, Inc.
Hickman, Williams & Co.
Frederic B. Stevens, Inc.
Superflux Mfg. Co.

FLUXING TUBES

Great Lakes Carbon Corp.
National Carbon Co., Div. Union Carbide Corp.

FOUNDRY SUPPLY HOUSES

Archer-Daniels-Midland Co. Federal Foundry Supply Div.
Hickman, Williams & Co.
Frederic B. Stevens, Inc.
Whiting Corp.

FURNACES

Ajax Magnethermic Corp.
Brown Boveri Corp.
Hevi-Duty Electric Co.
Lectromelt Furnace Div. McGraw-Edison Co.
Lindberg Engineering Co.
Whiting Corp.

GREEN SAND ADDITIVES

American Colloid Co.
Archer-Daniels-Midland Co. Federal Foundry Supply Div.
Bariod Chemicals, Inc. Div. of National Lead Co.
Hickman, Williams & Co.
Reichhold Chemicals, Inc.
Frederic B. Stevens, Inc.

GRINDERS

Grinding & Polishing Machinery Corp.

GRINDERS, PNEUMATIC

Airetool Mfg. Co.

HARDNESS TESTING EQUIPMENT

Harry W. Dietert Co.

INOCULANTS, GRAPHITIZING

Union Carbide Metal Co., Div. Union Carbide Corp.

INVESTMENT CASTING EQUIPMENT & SUPPLIES

Harbison-Walker Refractories Co.
Alexander Saunders & Co.

LABORATORY TESTING EQUIPMENT & SUPPLIES

Beardsley Piper Div. of Pettibone Mulliken Corp.
Buehler, Ltd.
Harry W. Dietert Co.
Carver Foundry Products
Great Lakes Carbon Corp.
Lindberg Engineering Co.
Pasadena Hydraulics, Inc.

LADLES

Industrial Equipment Co.
Modern Equipment Co.
National Carbon Co., Div. Union Carbide Corp.
Whiting Corp.

LADLES & SUPPLIES

Archer-Daniels-Midland Co. Federal Foundry Supply Div.
Industrial Equipment Co.
Modern Equipment Co.
National Carbon Co., Div. Union Carbide Corp.
Whiting Corp.

MAGNESIUM ALLOYS

Ohio Ferro-Alloys Corp.

MAGNETIC SEPARATORS

Royer Foundry & Machine Co.

MAGNETS

Ohio Electric Mfg. Co.

MANGANESE ALLOYS

Ohio Ferro-Alloys Corp.
Union Carbide Metals Co., Div. Union Carbide Corp.
Vanadium Corp. of America

MANHOLE FRAMES, ADJUSTABLE

Adjust-A-Frame Corp.

MATERIAL HANDLING EQUIPMENT

Frank G. Hough Co.
Modern Equipment Co.
National Engineering Co.
Ohio Elect Mfg. Co.
Roura Iron Works, Inc.
Royer Foundry & Machine Co.
Simplicity Engineering Co.
Syntron Co.
Whirl-Air-Flow Corp.
Whiting Corp.

METAL CASTING PLASTERS

Bestwall Gypsum Co.

METALLURGICAL APPARATUS

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Harry W. Dietert Co.

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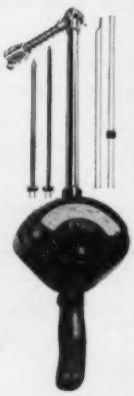

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The Editor's Forum . . .

Where would our metalcasting industry be in 1961 if it weren't for the new technology of the past 15 years? Without a doubt it would be a third-rate, depressed industry incapable of competing in today's market places.

The first report of MODERN CASTINGS 1961 Trend Panel credits the healthy vigor of our industry to the technological advances created and applied in the past few years. This Panel is comprised of bellwether leaders who produce castings plus those who sell supplies and equipment to the foundry industry. (Be sure to see the complete report of their opinions on page 45.)

A veritable panorama of progress in metalcasting becomes immediately apparent when we take a close look at the numerous advances credited by Panel members for their ability to compete in 1961.

Let's look first at the new metallurgical developments. Take ductile iron for instance. Here is a material that was non-existent 15 years ago. Today it accounts for about 200,000 tons of casting business and is destined to set a record high in 1961! Ductile iron is winning new business from weldments and is now going after a sizeable share of the centrifugal cast pipe market. Use of pearlitic malleable iron has grown 800 per cent in 15 years and promises to keep malleable foundries going at a good pace this year.

The improved metallurgical control needed to produce ductile iron and pearlitic malleable has led to refinements in cupola operations, such as water cooling, carbon-lined wells, basic lined shafts, hot blast, and greater use of scrap instead of higher priced pig iron. Deleterious trace elements are being removed and more alloys are being added to raise the physical and elevated temperature properties of all cast metals. Electric furnaces are being installed for gaining melting flexibility and improved metal quality.

The war on weight has focused on unprecedented interest in aluminum castings. The aluminum automotive engine block has probably attracted more attention than any other product innovation in the past decade. The last 12 years has seen the aluminum casting market double.

Many of the Panel members attributed their success in today's markets to the great advances made in sand molding and core making. Certainly such new sand binders as phenolic and urea resins, furfuryl alcohol-urea formaldehyde, sodium silicate, and air-set have given new capabilities of accuracy and quality to metalcasting. Add to these such recently introduced systems as the Shaw process, waterless-sand, olivine sand, ceramic molds, and ceramic shells and you can well appreciate how effectively the foundry industry has climbed the ladder of new technology to extend its competitive parameters.

Members of our Metalcasting Trends Panel emphasize how the new molding concepts attract new business from customers who want greater as-cast accuracy in the castings they buy. Improved dimensional tolerances, thinner cast sections, and better surface finish mean less expensive machining—and often complete elimination of need for any machining!

Electronic sand controls and high pressure molding have combined to give green sand molding an unprecedented competitive status in the past several years. Human error has been eliminated through completely new concepts of mechanized and automated mold and core making.

Many metalcasters attribute their very existence in 1961 to the giant steps made in new die casting and permanent mold technology. By 1965, its estimated that aluminum permanent mold casting will be 6 times as great as 1949 and aluminum die casting will be 12 times the 1949 production rate! This progress has been aided by technical developments in new casting alloys, new die materials, and new and larger casting machines, vacuum die casting, and design engineering.

Industry leaders can walk through their shops in 1961 and see job after job that would have been impossible to cast 15 years ago. By educating themselves with the new technology and applying it in production for profit they have strengthened their individual operations and gained a new respect for the entire metalcasting industry today.

Jack H. Lehman

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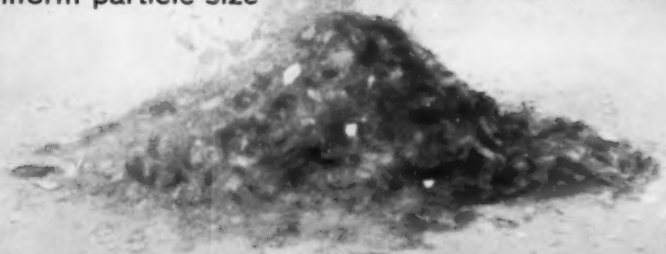

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